WIRE

SEPTEMBER 1940

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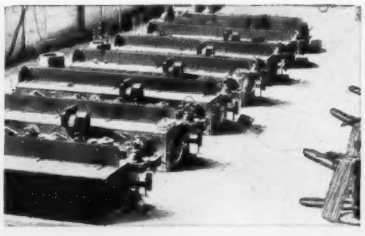
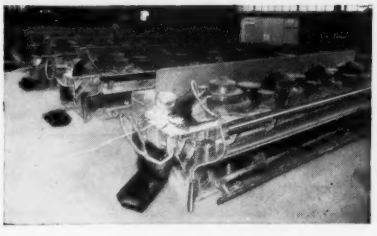
THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.



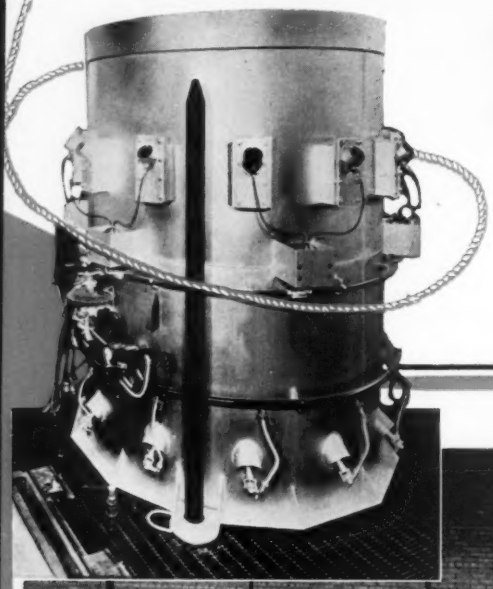


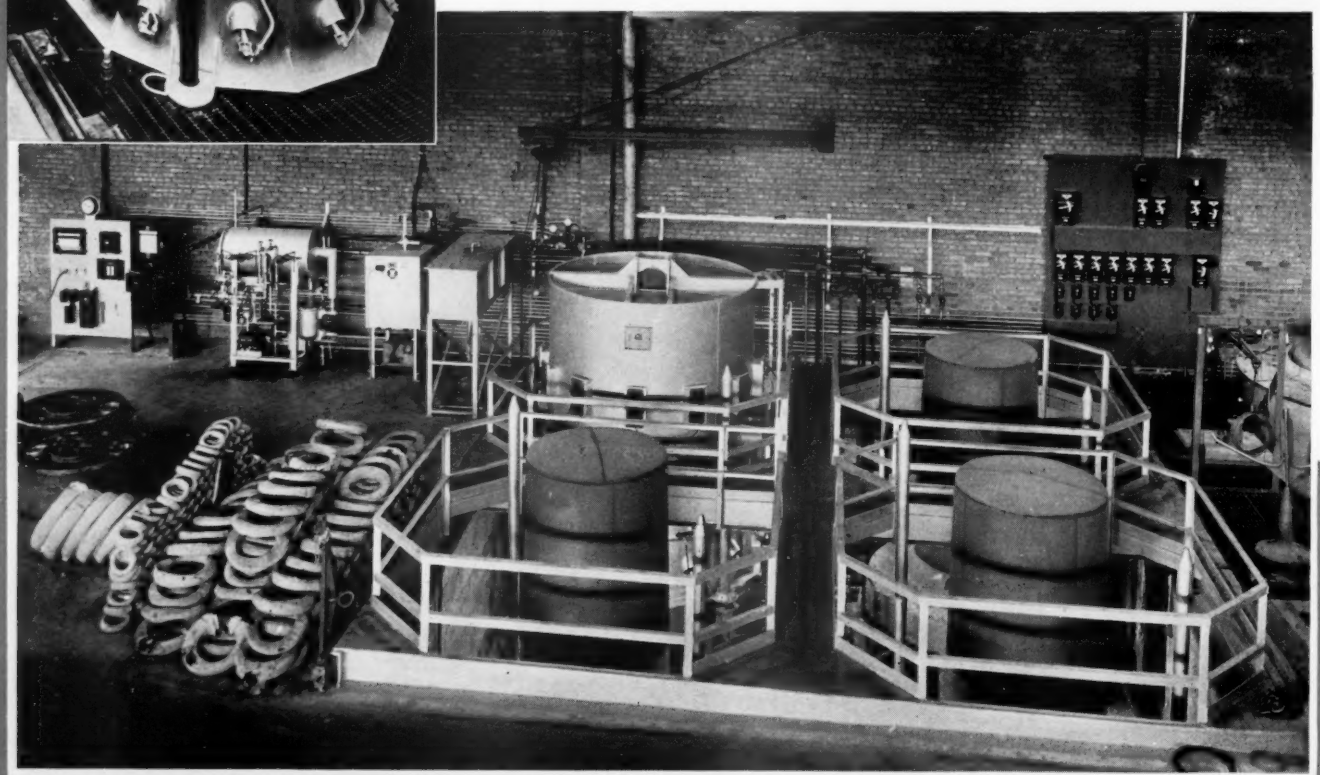
OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

Out where the west begins

Wilson furnaces

are ANNEALING WIRE





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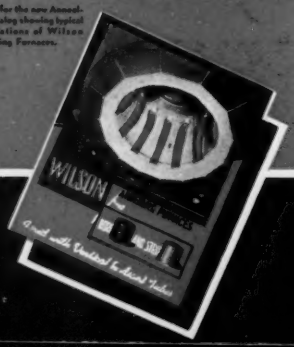

An Exclusive Development of

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1370 Blount Street • Cleveland, Ohio

The Wilson Annealing Unit is covered by Patents Nos. 1952402, 2068477, 2078356, 2081612, and other patents pending.

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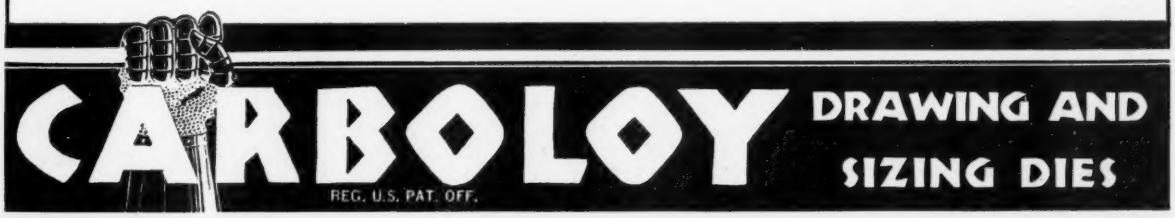
Authorized Distributors: Hartley Wire Die Co., Thomaston, Conn. • Canadian General Electric Co., Ltd., Toronto, Canada



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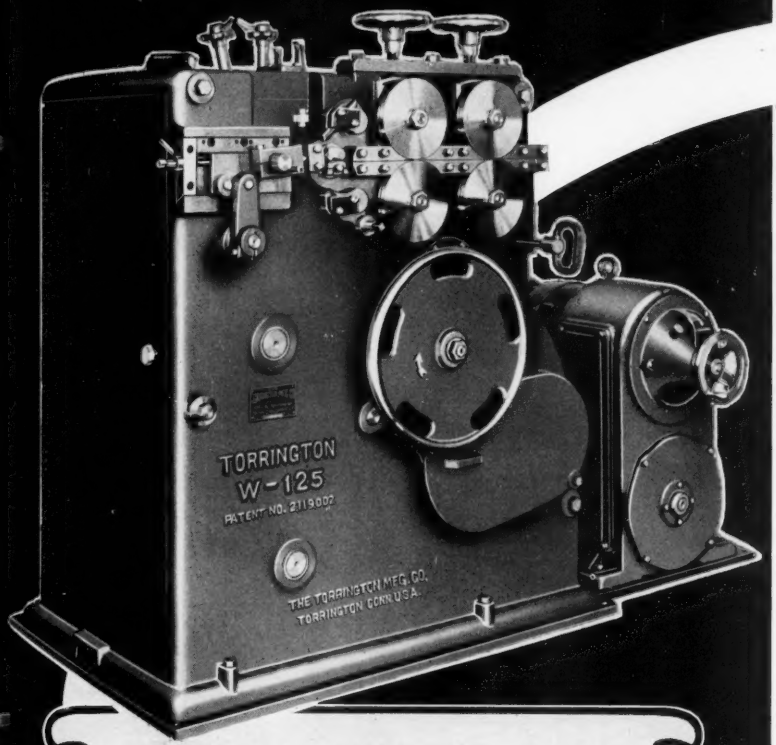

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Spring Making Machines by

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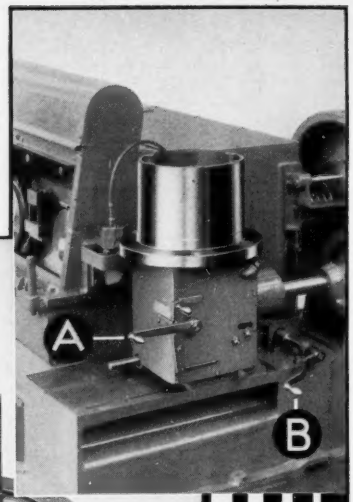

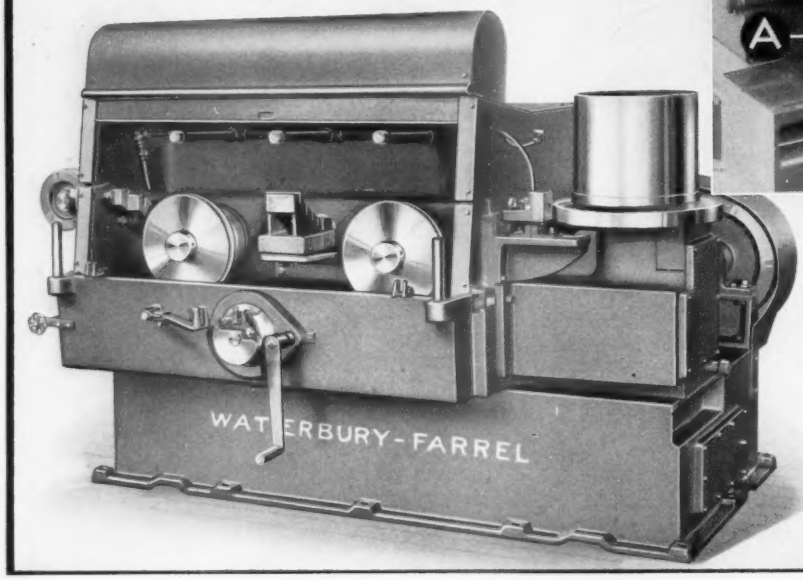

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by WATERBURY-FARREL

WITH WIRE BLOCKS WHICH *rotate in either direction*

Upright Cone Continuous Machines with provision for quickly changing the rotation and position of block.
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A — changes direction of rotation
B — shifts position of block - - -

The machines are available with blocks of various diameters or with spooling devices. Our wire drawing machinery is described in Catalog W.

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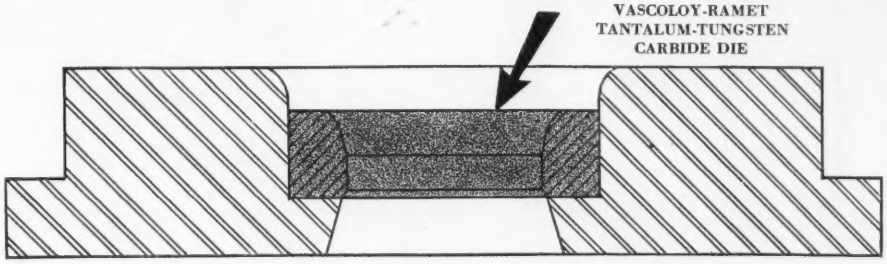
SHELLS, TUBING, ROD

Where Fine Finish Really Counts



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The big difference between "good enough" and really fine workmanship is the Tantalum Carbide in Vascoloy-Ramet dies, which reduces coefficient of friction by imparting a peculiar lubricating action. At the same time, Tantalum Carbide controls the physical structure of the die material to make possible a long-wearing, ultra-smooth finish, which means a smoother finish on the work.

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I'LL GET SOME NEW IDEAS!
AND SWELL ENTERTAINMENT!
PUTS NEW LIFE IN YER!
AND BIG EATS!
GREAT CHANCE TO SWAP IDEAS
TO THE CONVENTION

Are You Coming To Cleveland, O. October 21-25, 1940?

To Attend

The Tenth Annual Convention

of the

Wire Association

CONVENTION HEADQUARTERS WILL BE AT THE HOTEL CARTER

✦ ✦ ✦

IN addition to the program shown on the facing page, a splendid opportunity is offered to discuss informally, routine production problems and to exchange opinions and ideas regarding equipment and processes used in the industry.

✦ ✦ ✦

FOR this purpose informal gatherings are held at the Wire Association headquarters in the Hotel Carter, which are open from 9 A. M. to 11 P. M. during the convention.

✦ ✦ ✦

EVERY wire production executive engaged in the manufacture or fabrication of wire and wire products of any kind is invited to join The Wire Association and attend these meetings.

✦ ✦ ✦

THERE WILL BE A REGISTRATION FEE OF $5.00.

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TENTATIVE PROGRAM (Subject to Revision)

WIRE ASSOCIATION ANNUAL MEETING, Cleveland, Ohio, October, 1940

Technical Papers Will Be Preprinted in the October, 1940 Issue of Wire and Wire Products

✦ ✦ ✦

The Discussions and the Mordica Memorial Lecture Will Be Printed in the January, 1941 Issue of Wire and Wire Products

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Wire Association Annual Dinner and Smoker.

American Society for Metals Dinner

The Mordica Memorial Lecture. Will Be Presented By B. L. McCarthy, Chief Metallurgist, Wickwire Spencer Steel Co., Buffalo, New York

"The Use of Plane Polarized Light and Sensitive Tint Illumination in the Analysis of the Microstructure of Steel"

Wire Association Luncheon
Guest Speaker, C. M. White, V. P. of Operations
Republic Steel Corp., Cleveland, Ohio
Topic: Steel Quality and Labor Relationship.

✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦ ✦

PAPER: "What Does Good Laboratory Practice Do To Help Production in the Steel Industry"
By Geo. P. Lenz, Metallurgist, Union Drawn Steel Div., Republic Steel Corp.
Massillon, Ohio

MOTION PICTURE: "Application of Tungsten Carbide Tools and Dies"
Accompanied by Questions and Answers
Firth Sterling Steel Company
McKeesport, Pa.

PAPER: "Electro Chemical Applications in the Wire Industry"
By Dr. C. L. Mantell,
New York, New York

MOTION PICTURE: "Copper From Mine to Market"
Phelps Dodge Copper Products Company
New York, New York
Narrator—H. A. Stout

PAPER: "Uses of Lime in The Wire Industry"
By D. E. Washburn, Chief Chemist,
The Warner Company
Bellefonte, Pa.

PAPER: "Tungsten Carbide Dies and Tools"
By James R. Longwell,
Chief Engineer,
Carboloy Co., Inc.,
Detroit, Michigan

PAPER: "Recent Developments in Heating Copper Wire Bars"
By John A. Doyle, V. P.,
W. S. Rockwell Company
New York, New York

PAPER: "The Endurance Properties of Hard Drawn Wire from Various Kinds of Copper"
By John N. Kenyon, Instructor
Civil Engineering Department
Columbia University,
New York, New York

PAPER: "Reactive Drawing Results"
By H. A. Stringfellow,
Worcester, Mass.

PLANT INSPECTION:
Trauwood Engineering Co.,
Cleveland, Ohio
Electric Direct Resistance Wire Treating Unit.

PAPER: "Galvanizing Characteristics of Different Types of Steels"
By Robert W. Sandelin, Metallurgist
Atlantic Steel Company
Atlanta, Georgia

PAPER: "Design and Operation of a New Copper Wire Drawing Plant"
By H. Blount, Mfg. Engineer
Point Breeze Works, and
J. D. Wiltrakis, Engineer,
Kearny Works,
Western Electric Company

(This paper will be illustrated by both motion picture and lantern slides and describing drawing .036 copper wire at 10,000 ft. per min.)

PAPER: "Development of Apparatus For Shaving Copper Wire Commercially"
By C. E. Weaver, Dev. Engineer,
Works Laboratory,
General Electric Company
Schenectady, New York

There Will Also Be Papers on Cold Heading and Spring Making and the Exposition and Show in Association With the National Metal Congress.

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And at the daily technical meetings of the Metal Congress over 70 lectures on various phases of production, processing and fabrication of metals will be presented by leading authorities in your field.

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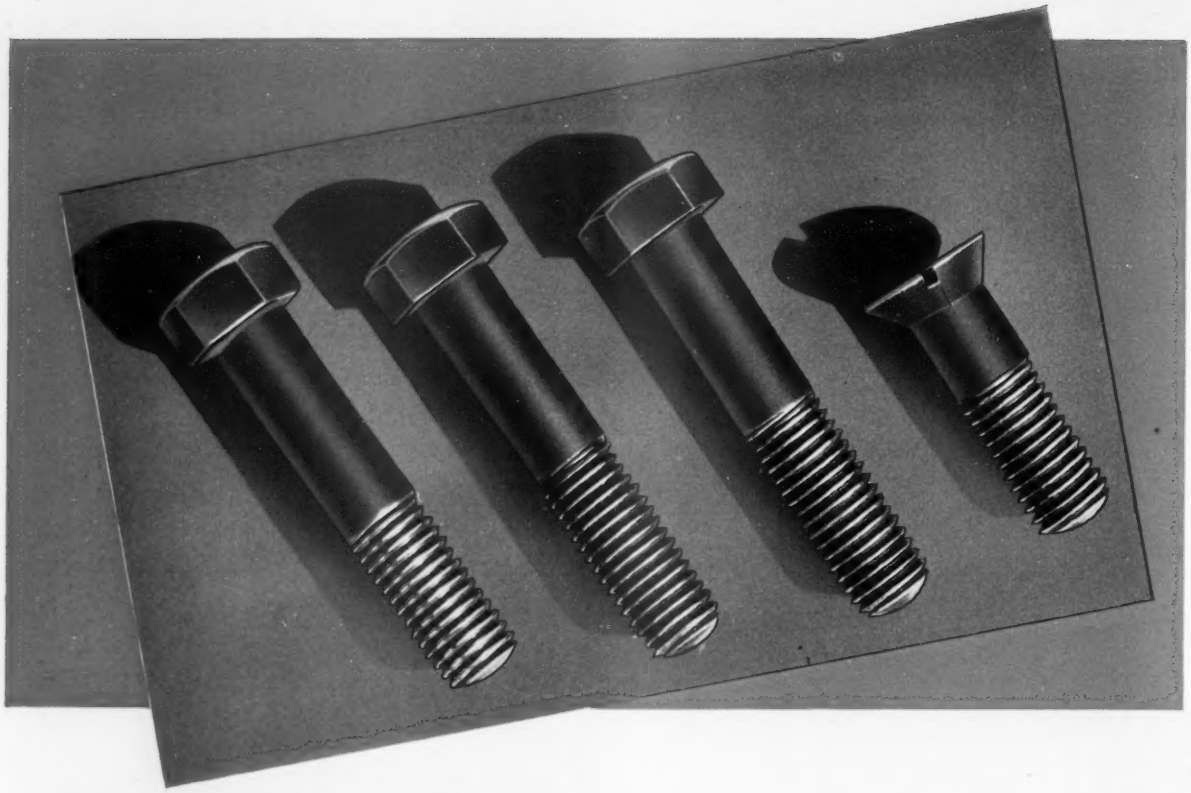
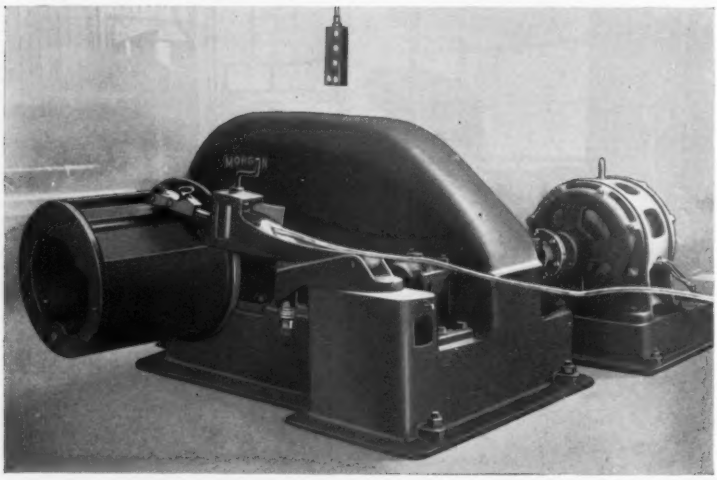


BOLT WIRE comes out a Head



You bolt manufacturers start with a piece of rod. You draw it, cut it, head it, thread it . . .
. . . and you have a good bolt if you start with a good piece of wire!

You will—when the wire is drawn for your purposes from approved stock—on Morgan Wire Drawing Machines. For, these machines, too, come out ahead—give more for the money.

MORGAN WORCESTER ENGINEERS AND MANUFACTURERS

Continuous Wire Drawing Machines; Take-up Frames; Horizontal Bull Blocks; Vertical Spindle Bull Blocks; Reels; Pointers; Wire Mill Accessories.

MORGAN CONSTRUCTION COMPANY
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W-54

WIRE DRAWING MACHINERY

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 15 SEPTEMBER, 1940 No. 9

Designated as

Official Publication By The Wire Association

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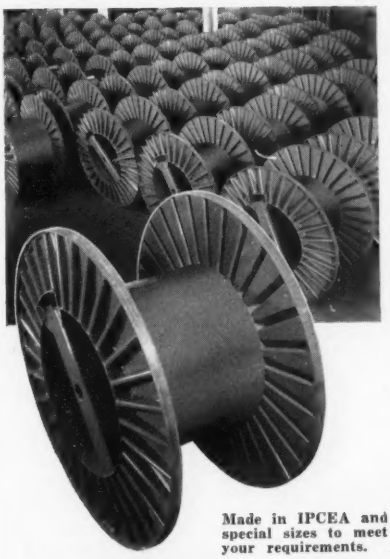
FLANGED STEEL DRUMS



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PROVIDES
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They are built to last—sturdy at the hub, and engineered with shock absorbing characteristics to withstand side stress. Write for interesting data and prices.

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Right to a T*

* Dies with the EXACT degree of *hardness* or *toughness* that you require . . . literally "right to a T" . . . result from the precisely controlled combination of Tungsten, Titanium, or Tantalum Carbide, by Firth-Sterling "powdered metallurgy!"

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A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 15 SEPTEMBER, 1940 No. 9

Die Inspection In The Wire Industry

By C. L. Mantell, Ph.D.,
Consulting Chemical Engineer and Metallurgist,
New York, N. Y.

This article was written in the hope that it will provoke discussion. The author obviously has stuck his neck out in a couple of places and some of the readers of WIRE & WIRE PRODUCTS may be out gunning for him. Such a situation, however, would not be an unmixed blessing, inasmuch as a discussion might contribute a number of interesting ideas. ✦ ✦ ✦ ✦ ✦

THIS article is a plea for die inspection systems. In many organizations the design of wire drawing machinery is a function of well trained mechanical engineers either in the organization itself or on the staff of the equipment suppliers. In matters electrical, motors, controls, and electrical mechanisms are the products of the ingenuity of well trained electrical engineers either in the wire drawing plants or associated with the electrical equipment manufacturers. Most of these designs are based on long continued experimentation and observation of performance. Information on these subjects is widely published and is readily found in the numerous handbooks.

✦ ✦ ✦

IN contrast, published information on dies is relatively meager, although some of the large companies in the business, through their technical staffs, have produced valuable technical papers on dies and die designs. Some of these, however, are buried in the transactions of our metallurgical societies, inasmuch as they have been the concern largely of metallurgists. To all intents and purposes, these studies of die design are unknown to small plants.

CHARLES L. MANTELL
Ph.D. is a member of the American Institute of Mining and Metallurgical Engineers, American Institute of Chemical Engineers, American Society for Testing Materials, American Society for Metals, The Electrochemical Society and the American Chemical Society.

✦ ✦ ✦

DIES, their manufacture, use, abuse, are far too often surrounded by an aura of secrecy. Perhaps an analogy may be found with the old varnish making industry where the practical varnish maker kept most of his so-called secrets to himself and imparted as little information as possible to enhance his own value. This situation was rapidly broken down by the chemical development of the synthetic resins. These were developed by chemists with no background in the varnish industry. They rapidly publicized the method of use of the resins and in turn rapidly eliminated the old varnish maker.

✦ ✦ ✦

IN a similar manner, synthetic dies for wire drawing, particularly those of the preformed type made of tungsten or tantalum carbides or related materials, bonded together with metals such as cobalt, were produced. While knowledge of the manufacture of these dies has not been broadcast, a far wider distribution of information as to their use has re-

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sulted than is the case with the much older diamond dies. Carbide dies to a very large extent have replaced draw plates for accurate size wire up to one-quarter of an inch or more. It is interesting to note that in "The Making, Shaping and Treating of Steel," the instruction book of the Carnegie Steel Company, in the 1925 edition there is no mention of carbide dies, while diamond dies are treated only in the following short paragraph:

"Diamond Dies are frequently used when exceeding accuracy and uniformity of section are required in the finer sizes of wire, especially in the process of continuous wet drawing. In the construction of diamond dies, a diminutive flat crystal of diamond is securely fastened in a center opening of a small circular metal disc, then a hole of required diameter is worked through this diamond by means of special drills and diamond dust. Diamond is one of the hardest substances known and has great wearing qualities. Long lengths of fine wire can, in consequence, be drawn through these dies with little or no change of sectional area due to wear of the die."

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IN **"The Book of Stainless Steels"** edited by **Ernest Thum,** published by the American Society for Metals, second edition 1935, wire drawing schedules for stainless are given as shown in Table I.

"The drawing schedule for hard wire depends on the size of the finished wire. For instance, 0.023-inch wire with tensile strength of 280,000 lb. per sq. in. must be drawn down from 0.072 inch without any intermediate anneals."

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THERE is no mention of die design or usage of the dies.

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IN **Anderson's** book **"The Metallurgy of Aluminium and Aluminium Alloys"** published by Henry Carey Baird & Co., Inc., in 1925, drawing practice is briefly discussed with only a mention that diamond dies are employed for drawing finer size wire. In **"The Aluminum Industry"** by **Edwards, Frary, and Jeffries,** published by McGraw-Hill Book Company in 1930, the brief discussion of wire and cable does not even indicate the types or shapes of dies. **"The Working of Metals,"** published by the American Society for Metals in 1937, mentions dies in one line, while in **the National Metals Handbook, 1939 edition,** also published by the American Society for Metals, wire drawing dies are completely covered by the following paragraph:

"While chilled cast iron, cast chromium steel, and forged steel dies are still used, tungsten carbide dies are rapidly displacing them. Diamond dies are still preferred on very small sizes of 0.010-inch diameter and under, up to 0.025-inch diameter for finishing drafts. Because of limited production of 'shape' wire, hardened punched chromium steel dies are employed."

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IN some plants the diamond dies are employed for sizes smaller than 0.036; in others, they may be used for wire sizes below 0.025. It has been the writer's experience that while the preparation of carbide dies and the manufacture of these may also be considered as closely guarded secrets, the knowledge of their use and maintenance is wide-spread. Given ordinary mechanical ability, it is not difficult for an operator to become quite expert in handling of carbide dies, maintaining entrance angles, die diameter, bearings, exit angles, and die shape. Wire drawers in general do not abuse carbide dies, although in many plants they probably treat them with less respect than they would a good file or first-class wrench. In the case of diamond dies, however, the preparation of these and their drilling is surrounded in many cases with an aurora of secrecy coupled with the "art" of the jeweler as well as fairy tales of unusual manual dexterity possessed only by one with long experience with diamonds.

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WITH specific reference to diamond dies, there does not seem to be any agreement among the manufacturers of these essential tools as to the shapes of stones that they should use, the weight of the diamond in carats for a specific size of die; nor is there any agreement upon methods of testing the stones in advance as to their suitability for dies. Some of these manufacturers talk quite glibly of furnishing "harder" stones than their competitors, yet they are very vague as to any methods of determination of this hardness. Some die manufacturers prefer flat plates if these are obtainable; others insist upon the use of irregular crystals approaching round forms. Some maintain that sufficient skill does not exist in the United States for the manufacture of fine diamond dies; others dispute this statement vigorously. There does not seem to be any uniformity as to mounting of the stones in the die casing, each manufacturer or even individual die maker in different plants maintaining a special practice involving steel mounting, bronze mounting, brass mounting, or special alloys. There seems to be little agreement on the types of casing materials, whether these be of brass or bronze or beryllium-copper or ferrous alloys. It would appear that the mounting materials in a number of cases are those set by the limits of the heating equipment available and the maximum temperatures reachable by this heating material. Having set the stone in the mounting and the mounting in the casing, there is none too great uniformity as to the method of drilling, the entrance angles, the length of bearing, and the exit angles of the die.

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WHILE there seems to have been appreciable penetration of the engineering viewpoint into the operations of the die manufacturers, with appreciation of mechanical precision, rigidly mounted machine tools free from vibration, well maintained and accurate tools, this is not always the case where plants make dies for their own use. Herein there often enters some of the hocus-pocus of the jeweler blended with the old-fashioned

Table I

Die Diameter	Dry or Wet	Lubricant	Die Material
0.210, 0.175, 0.150 in.	Dry	Soap	High carbon chromium steel
0.123, 0.100 in.	Dry	Soap	
0.068, 0.055 or 0.060 in.	Dry	Soap	Tungsten carbide
Down to 0.040 in. in multiple	Dry	Soap	Tungsten carbide
Down to 0.022 in. in multiple	Dry	Soap	Tungsten carbide
0.022 down to 0.004 in. in multiple	Wet	Soluble oil	Diamond

secrecy of the varnish maker and lack of receptivity of new engineering ideas. Often die shapes are the result of chance much more than planning. While in the chemical, metallurgical, and mining industries there have been intensive and wide-spread studies on particle size, size classification, and careful separation of sizes of particles, none of this information is applied to the grading of the diamond dust used for drilling and polishing of diamond dies. The craftsmanship of the die maker has been unable to borrow valuable ideas from apparently unrelated fields.

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FAR too often a die is judged to be good or to be the best possible because the die maker has said so. Even simple optical examination with low powered microscopes rather than the "loop" of the watchmaker have indicated this is not so. Optical examination with binocular microscopes, with adjustable stages for holding the dies so that the die can not only be rotated but also tilted, indicates that rapid examination of entering surfaces, throats, bearings, and exits of dies can be readily made. As a result of such examination, with a cooperative die maker marked improvement in die quality and resultant die performance can readily be achieved.

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A NUMBER of methods have been proposed at various times for measurement of die angles. These consist in the main of using fusible metals from which a cast of the die is made. The resultant shape may then be measured with reasonable accuracy. With adjustable stages on microscopic equipment and calibrated eyepieces for ranges of dies, much of this measurement may be done, despite the reflective characteristics of the polished diamond, with reasonable ease.

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IT is enlightening at least, particularly in small plants and in this day of standardization, accounting, and production control, to encounter the many loose systems of die usage. In small plants, accounting and record keeping of dies is too often the exception rather than the rule. In many cases the dies are not treated by the wire drawer as if they were well maintained tools; or if he has this viewpoint, he himself maintains a personal stock of "good" dies. Far too often dies are issued as required and accounted for at inventory period, being fished out of the bottom mud of improperly maintained drawing machines or else are jumbled together in a spare box in a corner of the wire drawing department. Dies which are lost or missing are charged up to the fun of being in the wire business. Too often dies are severely abused, particularly when employed in trains by wire drawers of the strong-backed and weak-minded variety who insist that if there are six dies in the train, five of them may be scratched out of shape, but if the sixth one is perfect, by some miraculous rectification this finishing die allows the production of round, straight wire.

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IT is felt that no wire drawing plant can afford to be without die control, perpetual inventory of these essential tools, and periodic inspection, either at the end of every production job or at the end of every order. Inadequacy of supply of dies is perhaps a far greater reason for abuse of these mechanisms than is mistreatment by the wire drawer. No management has the right to expect good performance in terms of finished wire from inadequately maintained dies. Die manufacturers seldom really know the actual performance requirements of their customers. Some times, however, when they do have this information and attempt to satify these needs, obstacles are met in the shape of purchasing agents to whom price is the major criterion rather than quality of workmanship and finish. Simple inspection systems, individual die record cards, performance characteristics on the dies as a result of these records, coupled with inspection and cost accounting in a very short time reduce the monetary losses caused by careless wire drawing, eliminate dies which are cracked and broken in service, and increase their life. From such systems economic balances for the particular plants may be made between the size of diamond and the hole size of the die, the lack of desirability of allowing the die to enlarge more than one drawing size before repolishing, the definite desirability of frequent inspection of the die for its surface, and the indication that die lives are often lengthened by frequent minor polishings rather than one major treatment of this nature. Tools, gauges, and similar devices for determining the draw pull on a die are all available. Projection equipment for examining roundness of dies cannot usually be afforded by small plants, but simple gauging of wire drawn through the die in a test block will readily detect any out-of-roundness of the die itself.

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DIE inspection systems and die records bring in their train necessary improved mechanical maintenance of drawing machines. Insistence on die performance causes insistence by the wire drawer that dies be properly aligned and die holders be well maintained; that take-up blocks, tensions, capstans, and other portions of wire drawing machinery be true and in their best operating condition. Shortly, as a result of focusing attention on dies by the installation of inspection and record systems, quality of performance is increased, costs are reduced, and engineering penetration with increased borrowing of ideas from other industries apparently unrelated (although actually they are from a fundamental basis) rapidly results.

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DIE inspection systems in large plants, particularly those associated with the incandescent lamp industry, with the manufacture of vacuum tubes, and with precision wire, have been carried to an elaborate stage for the reasons that such controls are essential to the high performance standards of these industries. Smaller plants too often attempt to substitute so-called craftsmanship for quantitative measurement, and thus handicap themselves by not making available to their own use simple aids to increased production and higher quality.

SLEEPER & HARTLEY INC.

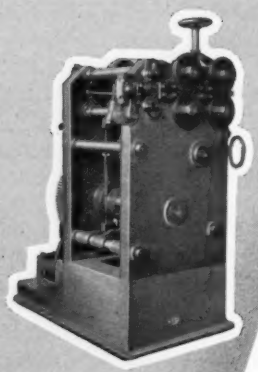
Worcester, Mass.

Built the FIRST Automatic Spring-Coiling Machine in 1911

(A No. 2 Series 254
50 Springs per minute)

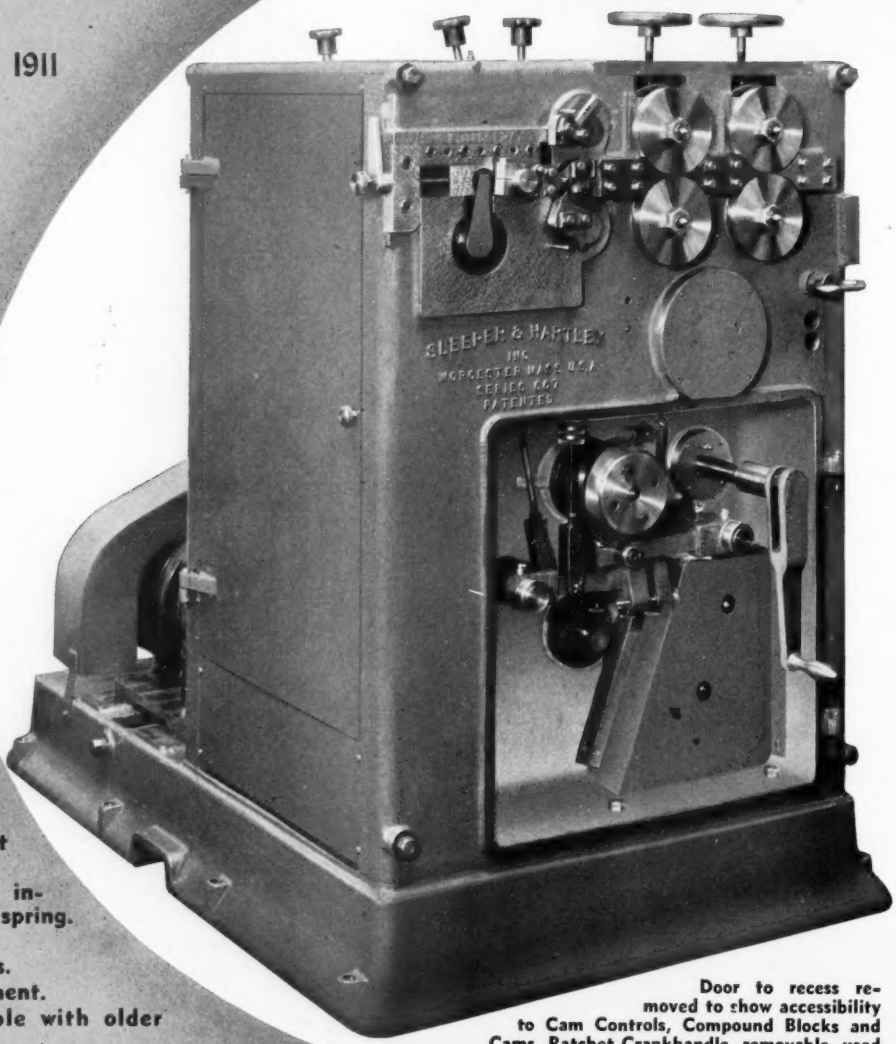
The NEW-IMPROVED No. 2 Series 667 Arrived in 1938

(Production from 17 to 110 Springs per minute)



1911

1938



Door to recess removed to show accessibility to Cam Controls, Compound Blocks and Cams. Ratchet Crankhandle, removable, used for set-up purposes only.

In the spring-coiling machine field there are 14 Models from which to select (including Series 254) varying in price and capacity.

1938 DISTINCTIVE FEATURES

- Pitch and Diameter Cams and Compound Levers are accessibly located in the recess of front housing.
- Auxiliary Gearing to increase wire length per spring.
- Alloy Steel Tools.
- Anti-friction Bearings.
- Simplicity of Adjustment.
- Tools interchangeable with older models.
- Cams may be Shaped and timed on the Cam Hub and the entire unit removed.
- Morse Free-wheeling and Recoil Clutches.

War Contracts

By Lieut. Col. John P. Dinsmore

Chief, Contract Division, Planning Branch, Office of the Assistant Secretary of War. Member, War Contracts Board.
Lieutenant Colonel, Judge Advocate General's Department, U. S. Army.

A pressing problem of preparedness is the adequate safeguard to be applied to contractual procedure in time of war. Thousands of things in thousands of quantities must be bought. Purchases will range from chocolate bars and emergency kits to locomotives and seacoast guns. While the preservation of peace through victory is the one purpose of our armed forces, there are rights and duties arising from the relationhip of buyer and seller on the part of the Government and the individual citizen. These duties must be fulfilled and these rights must be protected. Each must be approached in a sense of fairness to the other. Government can ill afford to step beyond the bounds of firm discipline; the individual dare not, in conscience, take undue advantage of emergency conditions.

In this spirit, there recently have been made public by the Army and Navy Munitions Board the results of years of study as to the best and most simplified types of contracts to be used for the purchase of military supplies in time of war. An anaiysis of the several proposed types is presented here by an officer who is especially qualified.

In the belief that this article will be of particular interest to American industry and the professions, it will be reprinted as a brochure and will be distributed without charge. Readers who wish copies may obtain them upon application to the Editorial Offices of Army Ordnance, 806 Mills Building, Washington, D. C.

—Editor.

ON September 11, 1939, the Assistant Secretary of War approved six war contract forms for use in a national emergency. These forms are based on the accumulated experience and study of many years and represent a distinct forward step in their field. To evaluate them correctly and to understand their purpose and effect, some historical knowledge is necessary.

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DURING the World War the several purchasing agencies of the War Department evolved and used some four hundred different contract forms. The current administration of a vast number of contracts containing so many diverse provisions presented grave difficulties, but the abrupt termination and subsequent settlement of many thousand such contracts involved still graver ones.

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AS a result of that lesson, it was concluded that Government contract procedure should be standardized. As a result, in 1921 a board was created in the Bureau of the Budget on which all interested agencies of the Government were represented. After extended study, during which the views of interested sections of commerce and industry were obtained and considered, that board prepared and the President approved a group of standard contract forms covering all types of Government procurement, the use of which in peace time by all Government procurement agencies is now compulsory. These forms have been in daily use for many years, have been extensively interpreted administratively, and to some extent judicially, and are generally understood by Government representatives and industry alike.

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AT about the same time the board referred to above (known as the Interdepartmental Board of Contracts and Adjustments) was created, the War Department organized a board to prepare standard contract forms for use in war time, on which the Assistant Secretary of War, the Judge Advocate General, and all the Army's supply arms and services were represented. That board, in conjunction with the Planning Branch of the Office of the Assistant Secretary of War, has continuously pursued its task by making very extensive studies of War Department procurement problems, during the course of which criticisms and suggestions from industry have been freely invited and considered, and advice from the Navy Department sought and obtained. As a result, tentative war contract forms have been drafted and from time to time revised and re-revised. The forms now approved represent the fruit of that labor as well as the special efforts of a group of experienced officers on duty in the Office of the Judge Advocate General.

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THESE forms have been prepared upon the thoroughly sound theory that a national emergency will create new procurement problems but will not remove most of those present in peace time, and that provisions which, by actual use, have been found to preclude or to minimize controversies in peace-time contract procedure should be retained to the fullest extent practicable and supplemented only so far as may be necessary to meet wartime conditions.

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THE primary purpose of emergency contract procedure is to obtain supplies or installations in the quantity, of the character and quality, and at the time and place needed. Speed is always essential. One commentator has described an ideal war contract as one which can be let quickly, administered economically, and terminated with little aftermath. But there are

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other considerations. For example, it is quite generally agreed that excessive profits must be eliminated and actual profits drastically limited — a result which may be accomplished fully only by taxation, and not by contract procedure alone.

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NOR does it follow that the rights and interests of Government war contractors may be disregarded. On the contrary, fair dealing, common sense, good business, and the Government's own interest require that such rights be respected, because in a great many if not in all cases, the whole-hearted cooperation of contractors is essential if results are to be satisfactory. Unless their interest in economy, promptness, and faithful execution can be enlisted, any program is very apt to falter and perhaps to fail. With this thought in mind, it has been said by one familiar with their terms that the purpose of the present war contract forms is to initiate early production, prevent undue profits, protect the contractor against undue hazards, and provide for prompt payment and early final settlement.

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IN the order in which they will be discussed, the war contract forms are the: (1) Requisition order, (2) Construction contract (fixed-price), (3) Contract for supplies (fixed-price), (4) Short-form contract for supplies, (5) Contract order A, (6) Contract order B.

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ALTHOUGH it is not strictly applicable to the person to whom a requisition order is issued, for brevity and convenience the word "contractor" will be used in this article in describing all forms.

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THE most potent but, if World War experience is repeated, the least likely to be used of the new forms is the requisition order. As is well known, Section 120 of the National Defense Act, passed in 1916 (39 Stat. 213; 50 U. S. Code, 80) empowers the President, in time of war or when war is imminent, through the head of any department of the Government, to place orders with any individual, firm, association, company, corporation, or organized manufacturing industry for any required product or material of the nature and kind usually produced or capable of being produced by any such individual, concern, or industry. It further provides that compliance with all such orders shall be obligatory and shall take precedence over all other orders and contracts theretofore placed with such individual, concern or industry. The statute provides that the compensation for any such product or material shall be fair and just.

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THE approved form has been prepared for use in those cases in which the President may find it necessary to exercise, through the Secretary of War, the authority conferred on him by this statute. It is a mandatory order, compliance with which is compulsory, but it contains provisions which are designed to encourage willing compliance with its terms. These include a provisional price which will enable the manufacturer to receive payment for units delivered without awaiting a final price determination and definite statements concerning matters which are frequently the subject of dispute, such as customs duties, taxes, changes, inspection, payments, and delays.

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IF it is possible at the time the order is issued for the War Department to fix a unit price which it considers fair and just, the price so determined will be named in the order, and the person to whom the order is issued, provided he is willing to do so, may formally indicate his acceptance of it and settlement will be made accordingly. If the price named is not satisfactory to the manufacturer or supplier, he may so indicate, in which event the form provides for the payment to him of a percentage only of the amount designated and expressly recognizes his constitutional right to institute suit against the United States for such additional amount as he may believe he is entitled to receive as the remaining portion of fair and just compensation.

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IF for any reason it is impracticable to determine in advance what compensation will be fair and just for the material or products called for by the order, the form provides for the fixing of a provisional unit price. This will be used for settlement purposes pending later determination by the Secretary of War of the actual price to be paid, at which time the account will be adjusted by application of the final price so determined to all articles covered by the order. The manufacturer may agree to accept this final price, or he may refuse to do so and elect to receive a sum less than the full compensation so fixed, leaving the sum finally to be paid to judicial determination. Except for the compensation provided, the order must be accepted and fulfilled without reservation.

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THE construction contract (fixed-price) and contract for supplies (fixed-price) follow quite closely the corresponding peace-time standard forms with only such modifications as have been considered necessary to meet emergency conditions. In order to avoid repetition, a fuller description of these forms will be made in due course hereafter.

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THE short-form contract for supplies is, as its name implies, a relatively simple form designed for use in those cases in which well-known articles of standard type are desired for early delivery, no particular difficulties are anticipated, and the more elaborate provisions of the regular supply contract are deemed unnecessary. However, some of the provisions of the standard peace-time form are printed on the back of this short form and incorporated by reference, while other peace-time conditions designated as optional also are provided for use if desired.

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CONTRACT order A is a combination of a mandatory order issued under authority of Section

120 of the National Defense Act and a fixed-price contract for supplies. It is designed for use in those cases in which a manufacturer or supplier is able and willing to give preference to the production or delivery of supplies or materials required by the Government provided he can be relieved of responsibility for failure to comply with his outstanding commercial commitments. This result is accomplished by the mandatory order. In all other respects the form constitutes a fixed-price contract for supplies, and when the contractor signifies his willingness to comply with its terms, it becomes such a contract. Although this form does not follow strictly the wording of the contract for supplies, it embraces many of the provisions contained in that contract.

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ALL the forms so far discussed call for fixed prices, which fact indicates the War Department's purpose to use that form of contract to the fullest possible extent, even during an emergency. This is a sound policy. Fixed-price transactions are customary throughout the entire business world, and adherence to this practice will avoid many problems. Other methods may seem alluring, but experience demonstrates that they invite difficulties, both known and unanticipated.

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AT the same time, the fact must be faced that under emergency conditions the novelty of certain equipment required by the Government, lack of experience on the part of the prospective contractor—either with the product itself or with the process of its manufacture—necessary employment of new and difficult or complicated manufacturing procedure, or required expansion of plants or production facilities, may render it impossible for either the Government or the prospective contractor to arrive at a reliable cost estimate at the time the contract is executed. Under such circumstances, if the Government elects to insist on a fixed price, sound business and elementary principles of self-preservation require the contractor to name one sufficiently high to protect himself against all contingencies. The considered opinion of those who have studied this problem most thoroughly is that its best solution is one under which the contractor may be insured against loss and the Government protected against undue profits and waste.

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MUCH has been said and written about the iniquity of so-called cost-plus contracts and there can be no doubt that such contracts lend themselves readily to abuse. This was abundantly demonstrated during the World War when many contracts were so drawn as to give the contractor every incentive for extravagance and none whatever for economy of operation. But the fact seems to have been generally overlooked that the evil lies in the manner in which the cost-plus principle is applied rather than in the principle itself. Theoretically there is no reason why one type of contract should be more unfair to either party than another type. The fixed-price contract also may be abused. No form is foolproof.

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IN an effort to meet the situation last described with fairness to all parties concerned, in the light of World War experience the War Contract Board at one time prepared a form for the procurement of supplies known as the adjusted-compensation contract. This form was designed to supplant the straight cost-plus-a-stipulated percentage-of-cost contract used during the World War. It provided for a maximum and a minimum cost percentage with a provision authorizing the chief of branch to fix the contractor's fee within those limits upon the basis of an evaluation of the efficiency of the contractor's performance.

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THIS form had many advantages, including the very great merit of providing a simple and easily applied method of determining the amount due the contractor. Excessive profits were excluded. But the form was criticized severely because its application would require a number of involved and difficult determinations. Based on preliminary data prepared by the contractor, it would have been necessary, before the contract was executed, for the parties to agree upon eight different subjects; namely, the value of facilities owned by the contractor and to be used in the performance of the contract, the proper allowance for depreciation, the cost of rehabilitation, the cost of new construction, if any, the time of performance, the cost of material, the cost of labor, and the cost of overhead properly chargeable to the contract.

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THE fundamental difficulty of arriving at any reliable cost estimates with little or no cost information available is apparent. The critics of this form also pointed out that necessary negotiations might well consume considerable time under circumstances when time would be very precious, that the Government necessarily would be at a disadvantage in such negotiations, and that the whole plan would tend to encourage the contractor to attempt to obtain agreement to as high an estimate as possible. Subsequent evaluation of the efficiency of the contractor's performance by the chief of branch concerned would likewise require somewhat involved determinations and present other difficulties.

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CONTRACT order B was prepared in order to provide a form applicable to those situations in which cost, and therefore reasonable price, cannot be determined in advance but one free to the fullest possible extent from objectionable features. Like contract order A, this form combines a mandatory order issued under authority of Section 120 of the National Defense Act with the provisions of a contract for supplies. The effect of such an order on commercial commitments already has been pointed out. The unique feature of this form is that it really creates two contracts, or to be more accurate, a preliminary undetermined-price contract which becomes transformed into one at a fixed price. During its first

phase, such a contract will provide actual experience and therefore a sound basis on which to determine a reasonable fixed price for the entire contract. For example, if ten thousand units of a given product are required, the first thousand could be manufactured under preliminary-price provisions after which a definite price for all the units covered by the contract might be fixed and applied.

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BECAUSE this form is in a class of its own and because of widespread interest in the particular type of contract which it is designed to effectuate, a full description of its price provisions is deemed appropriate. The form recites that it is "now impracticable" to determine fair and just compensation for the material or products specified, for which reason the fixing of the price will be subject to later determination by the Secretary of War. Pending that determination, the form names a provisional unit price which may be varied by agreement as circumstances warrant, with the understanding that such provisional price will not be considered as having any bearing upon the price to be subsequently fixed.

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ACCEPTANCE of the price subsequently fixed will be considered as constituting a release of all claims arising under the contract order, except as otherwise provided therein. In the event the price subsequently fixed is not acceptable to the person to whom the order is issued, the form specifies that his account will be adjusted to provide payment of a stipulated percentage of the designated amount. It expressly recites that a suit may be instituted against the United States for such additional amount as the person to whom the order is issued believes he is entitled to receive as the remaining portion of a fair and just compensation.

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AS an alternative provision, after reciting that it is "now impracticable" to determine fair and just compensation by unit price, the form provides that payment for a stipulated number of units and services required under the terms of the contract order (or such number as the person to whom the order is issued and the Government representative executing the order may "hereafter agree" to be necessary for the purpose of determining a just compensation by a unit price) shall be the actual cost of production and a stipulated unit fee—or a fee consisting of a stipulated cost percentage.

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THE form sets forth the actual cost of production to be paid by the Government and the cost upon which the fee is to be computed when on a cost-percentage basis as follows:

"a. Cost of all direct labor and all direct and indirect materials definitely ascertainable as necessary for and devoted exclusively to the items required by this contract order. The Government shall have the option of furnishing any or all of the materials aforesaid and when this option is exercised, the cost of such materials will be included as part of the cost for the purpose of computing the fee. The cost of materials shall be the net cost for the purpose of computing the fee. The cost of materials shall be the net cost to the manufacturer; i. e., invoice cost less cash, trade and quantity discounts, plus duty, import expense, freight and drayage paid by the manufacturer. Scrap resulting from this order shall belong to the Government, or by agreement a proper amount representing the value thereof shall be credited to the costs chargeable to the Government under this contract order as may be provided by law.

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"b. A proper proportion of overhead expenses. By the term 'overhead expenses' is meant the indirect labor and other expenses incidental to manufacture and the general and administrative expense pertaining thereto, including the moving and rearrangement of existing equipment and the installation of new equipment and appliances purchased by the Government or acquired by the manufacturer under the provisions of this contract order. Premiums on such bonds, including performance and payment bonds and such insurance policies as may be required for the protection of the Government or required by statute, and premiums on such public liability, employer's liability, workmen's compensation, fidelity, fire, theft, burglary, and other insurance as may be reasonably necessary for the protection of the manufacturer will be included in overhead if approved in advance.

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"THE following items may be included in overhead but shall not be included in the cost for the purpose of computing the fee: payments under the Social Security Act; federal, state and local taxes or charges applicable directly to the items ordered; depreciation at fair rates on such property and equipment as is owned by the manufacturer and is being used in the performance of this contract order; and, if approved in advance royalties on patents used including those owned by the manufacturer, and rental charges paid by the manufacturer for productive utilities used in connection with this order. Overhead shall not include contributions to charity and other gratuities; bonus payments based on profits earned by the manufacturer; inapplicable research; appropriations to reserves for bad debts; excessive salaries; extraordinary repairs to buildings or other items properly chargeable to capital accounts; credit losses not satisfactorily accounted for; expenses incurred in connection with issue of new stocks or bonds; and income and profit taxes.

"c. The foregoing allowances shall apply to all labor, direct or indirect, and to all materials involved in the manufacture and services agreed to in this contract order whether items produced be accepted or rejected by the Government, or subsequently reworked after rejection, if so ordered, provided that in the judgment of the approving officer, the manufacturer, his employees and subcontractors and their employees

have taken due precaution to prevent and have not been guilty of carelessness, inferior workmanship, or unnecessary damage to material. Cost of reworking items rejected through failure of the manufacturer, his employees or subcontractors or their employees, to exercise due precautions shall be subject to special adjudication between the Government and the manufacturer. On such manufacturing work as the manufacturer may by specific authority procure by subcontracts, the fee allowed will be one-half of the stated fee if based on a per cent of cost; if based on a unit fee, the fee allowed will be reduced by an amount equal to —— per cent of the invoice cost of such subcontract work.

"d. If payment therefore is approved in advance, the Government will pay the cost of necessary machinery, equipment and appliances, and temporary structures required in the performance of this order, but such costs shall not be included in the cost for the purpose of computing the fee. Title to all such property shall vest in the Government.

"e. Higher rates of pay for labor than those usually and currently paid for similar work in the same locality shall not be allowed under this order. Materials, machinery, equipment, and appliances, paid for by the Government, shall be purchased at the lowest possible prices and subject to inspection and acceptance by the Government. Payments shall be made on a basis of actual expenditures after submittal of bills, payrolls, or statements of expenses involved, certified and submitted in such form as shall be directed by the chief of branch concerned. Fees and depreciation shall be paid monthly as they accrue, provided however that, pending the final determination as to the depreciation to be allowed, provisional monthly payments may be made. Accounts and records of the dealer and manufacturer shall be open at all times to inspection by the Government, and no change shall be required in the present methods and principles of keeping costs provided they are found adequate for the convenient and accurate determination of proper charges against the Government."

✦ ✦ ✦

THE form provides that the cost shall be subject to Government approval prior to payment thereof, and also provides that after production of the required number of units on a cost basis, a fair and just unit price based upon this production cost shall be determined by the Secretary of War for the remaining production and services required under the order. This price may be accepted by the person to whom the order is issued or rejected subject to payment of a percentage only of the designated amount due and the assertion through appropriate litigation of any further rights which the person to whom the order is issued considers himself entitled.

✦ ✦ ✦

UPON the assumption that the reader is conversant with the provisions of the Government standard forms used in peace time, extended descriptions of those forms and of all the provisions common to them and to the war forms is omitted. It may be stated, however, that all the war forms that have been described follow the standard peace-time forms by providing for changes in drawings, specifications, crating and packing instructions, and points and dates of delivery, with the proviso that an equitable adjustment of the amount due will be made if any such change increases or decreases that amount, and by relieving the contractor from liability for delays or defaults in performance due to unforeseeable causes beyond his control and without his fault or negligence, provided the Government is notified of the cause of such delay within ten days from its beginning. All forms, except the short-form contract for supplies, likewise contain the usual standard peace-time provision with reference to partial payments.

✦ ✦ ✦

SPECIFIC reference to particular statutes, such as the 8-hour law, have been omitted because it is imposible to foresee exact legal requirements in an emergency, but all forms, except the requisition order, are accompanied by instructions which require that any provisions respecting labor or materials required by law to be included in the contract shall be duly inserted.

✦ ✦ ✦

IN war time, a large measure of decentralization of administrative authority is essential; otherwise serious, costly, and perhaps fatal delays will result. For this reason the war forms confer upon the chief of branch concerned a large measure of the discretionary authority normally exercised in peace time by the Secretary of War. For example, all the forms except the requisition order authorize the chief of branch to approve changes involving not more than $25,000, and all forms except the requisition order and the short-form contract for supplies provide that any decision of the chief of branch concerning a question of fact shall be conclusive when the amount involved is $15,000 or less. Both the contract for supplies and the construction contract empower the chief of branch to authorize the adjustment of claims not filed within the time prescribed by the contract but filed during its life.

✦ ✦ ✦

ALL the war forms provide for adjustment of the contract price if the cost of labor or material used in its performance is changed by order or with the approval of a duly authorized federal or state agency. This provision does not appear in peace-time forms. All the war forms also provide that if any sales tax, processing tax, adjustment charge, or other taxes or charges (not including any income or excess-profits taxes) are imposed or changed by federal, state, or local authorities and made applicable directly upon the production, manufacture, or sale of the supplies covered by the contract, or, in the case of construction, properly chargeable to the contract, and are paid by the contractor, the amount due under the contract shall be increased or decreased ac-

cordingly. It is well known that uncertainties which must be faced by the contractor and hazards which he must assume always increase the Government's costs. If the contractor can be given reasonable assurance against loss, the principal obstacle to fixed-price contracts will be removed. It was with this object in view that the provisions just described were prepared.

✦ ✦ ✦

A PROVISION not used in peace but plainly desirable during war appears in all war forms, except that for construction, to the effect that articles which do not conform to contract specifications may nevertheless be accepted at a proper reduction in price.

✦ ✦ ✦

ANOTHER contract provision plainly necessary in war time is a clause giving the Government the right to terminate the contract at any time. Such a clause has been incorporated in all the war forms, accompanied in every instance by provision for a fair and just settlement. The exact form of this provision varies from a brief statement in the requisition order, short-form contract for supplies, and contract order B, respectively, that a fair and just settlement will be made, to rather elaborate provisions in the contract for supplies, provisions somewhat less elaborate in contract order A, and a provision in the construction contract.

✦ ✦ ✦

THESE provisions stipulate that if the contract is terminated, except for the contractor's default, an audit will be conducted by the contracting officer based on which the Government will pay to the contractor (1) all costs incurred by him, including plant rental, less amounts already paid, (2) an agreed percentage of the total cost, and (3) costs actually caused the contractor by the termination of the contract. The contract for supplies provides that if the contract is terminated, other than for the default of the contractor, the Government shall pay to the contractor (1) the contract price not previously paid for articles completely manufactured or work and services completely performed, and (2) for the uncompleted portion of the contract an amount to be computed as follows:

(a) There shall be determined by an audit conducted by or for the contracting officer the total net amount of all expenditures and obligations made or incurred by the contractor under the contract with reference to the uncompleted portion thereof. (b) The contractor and the contracting officer shall agree upon an estimate, based on the foregoing audit and any other pertinent data, of the net cost to the contractor of fully completing the contract had it not been terminated, including in such estimate all costs previously incurred under the contract as to its uncompleted portion as well as those costs which would be required in the future for its entire completion. If the contractor and the contracting officer fail to arrive promptly at such an agreement, the estimate will be determined in the same manner as any other dispute. (c) The percentage which the foregoing item (a) is of item (b) shall then be determined and a sum of money equal to that same percentage of the total contract price of the uncompleted portion thereof shall then be computed. (d) The total of all payments, if any, previously made to the contractor on account of the uncompleted portion of the contract shall be ascertained. (e) The contractor shall then be paid the sum computed in accordance with (c) above, less the total of item (d). If it is determined that the sum total of the payments so provided is not adequate to cover the costs to which the contractor has been subjected by reason of the termination of the contract, the Secretary of War may add thereto a sum sufficient to cover such costs and his action shall be final and conclusive.

✦ ✦ ✦

WITH variations conferring authority upon the chief of branch, all the war forms, except the requisition order and the short-form contract for supplies, make use of the standard peace-time dispute clause, but a novel feature in federal contract procedure is introduced by the insertion in contract order A and contract order B of an arbitration clause under which the Secretary of War may refer any appealed case to a board of three arbitrators, one of whom shall be selected and paid by the chief of branch concerned, one selected and paid by the contractor, and the third selected by the other two and paid, together with the expenses of the arbitration, by the parties jointly.

✦ ✦ ✦

THE form provides that the decision of this board shall not be binding on the Secretary of War, but that its findings and conclusions shall be given due consideration before his decision is rendered. The form makes it clear that the use of this clause must depend on future statutory authority. Alhough this clause does not deprive the Secretary of War of authority to make final determination of all questions of fact, those responsible for its preparation believe that its use will tend to remove any fear or arbitrary or unwarranted action in any such case.

✦ ✦ ✦

THE authors of these forms would be the last to assert that they are perfect. All human endeavor is progressive. But those who would improve them must remember that they represent the composite thought of a very large group admirably fitted both by training and experience for such an undertaking, and must admit that they evidence a high degree of War Department forethought and that there can be little if any doubt that they will accomplish the purpose for which they have been designed.

✦ ✦ ✦

Editor's Note.—Particular attention is directed to the degree in which the forms described above meet the general requirements of war contracts. These requirements are enumerated in the Industrial Mobilization Plan, Revised 1936, are to (1) initiate early production; (2) prevent unreasonable profit; (3) protect the contractor from hazards of war-time production while permitting a reasonable profit; (4) provide for prompt payment and early final settlement, and (5) provide for fair and prompt settlement in the event of cancellation or termination by the Government before completion. In addi-

(Please turn to Page 482)

On The Road To Mandalay

A Word About Jack Breining

About a year ago Jack Breining left the United States for India to become Plant Manager of the Indian Steel & Wire Products, Ltd., of Tatanagar, B. N. R., India. It had been expected that we would have an article in WIRE & WIRE PRODUCTS from Jack but it was found that he was too shy to write for publication. However, he has written an article without knowing it. The following abstracts from his letters to Kenneth Lewis consisting almost entirely of direct quotations are quite informative.

IN a foreword, Kenneth Lewis says this about an American working in India. "Everybody talks about the weather, as the philosopher said, but nobody does anything about it. According to Jack it's not necessary to do anything about it. India is a big country; with a climate as diversified as that of the United States, but it is tropical India we think of, and tropical India where Jack is established (150 miles west of Calcutta). Our notions concerning the horrors of tropical heat have come to us chiefly through Englishmen. With all due respect for his excellent qualities, the Englishman is a pretty poor reporter on climate. His idea of unendurable heat is a temperature at which he is uncomfortable in his long woolly underwear. I have been in London in one of its rare hot spells when the mercury climbed to the dizzy height of 82° and Englishmen were dropping in the streets like ripe plums.

✦ ✦ ✦

I TOLD Jack a man who had spent twenty summers in Monessen had nothing to fear in India. It is well known that Hell stocks asbestos blankets for Monessen boys." Here is Jack's testimony.

✦ ✦ ✦

JULY—We arrived here at the start of the rainy season, but as yet it has not been so bad. It is rather pleasant, not too hot.

✦ ✦ ✦

SEPT.—It was hot here this summer but it is getting cooler now.

✦ ✦ ✦

JAN.—It is now about 5 o'clock and I am sitting on the veranda. It is real pleasant, about 60° I should say, but in two hours it will get real cool. We are sleeping under two or three blankets. We wear our regular American clothes, and at night a top-coat, but during the hot season shorts or white trousers. The natives at present are nearly freezing in the mornings. They wrap themselves up around the head and chest with blankets, but go around barefooted.

✦ ✦ ✦

MARCH—Have had some letters from the states in which they say it has been very cold, but it has been nice here. From what I have experienced don't know why they say you can't stand the climate here. We are using a sheet and blanket at night, and only last night it was so cold we had to have another blanket.

JACK BREINING

✦ ✦ ✦

APRIL—I have been very busy at the mill since the war, but I think now I will take a day off and go in to Calcutta for a weekend with the wife. But it is getting hot here, and we may wait till later. You sure must have had a cold winter in the U. S. but it was grand here, just about right to wear a light coat at night, but just right all day. We had flowers all winter in the yard. It is rather dry now, and things are like at home in the hot weather, but rains will come in June and then everything just seems to spring out of the ground.

✦ ✦ ✦

JUNE—The hot season is on now, but I really must say that it is not so bad. We have had rain quite often and it has kept things pleasant. Only a few real hot days, once 113°. Louise and I are sitting in our yard tonight, and have an extension cord about 60 feet long so we can put a lamp most anywhere. (How about bugs, Jack?) It is real nice tonight, not too hot, and a nice breeze.

✦ ✦ ✦

Domestic Arrangements

WE have a very nice bungalow, four large rooms and two serving pantries. We have learned to like it very much. We have a very large yard, lots of flowers and shrubberies, and in October when the season comes we will have a garden. We have a nice bathroom with a big concrete tub.

✦ ✦ ✦

REGARDING servants Jack's accounts conflict, but he sub-

mits the accompanying photo which he says is "me and the dog and the servants." The regular staff seems to be: a headman, or butler, (they call him the bearer) a cook, a sweeper, a gardener and yard man, and a general laundryman. The sixth member of the group I can't account for; maybe Jack's personal maid. The little girl is a complete mystery—probably just a neighbor. This whole staff stands Jack about $20.00 a month, and they take care of themselves.

✦ ✦ ✦

IN another letter, he writes: "Well, Ken, the Big Event has come off. I have killed my first cobra. Mrs. Breining and I were out the other night, and coming into the yard with my flash-light, there was Mr. Snake, crawling out of some vines. I ran back and got a brick from our flower bed border. When I came back he was waiting for me, and I got him the first crack, and then finished him off with a stick. My wife said, 'Well, I hope your satisfied now; you have been looking for snakes ever since you got to India.'

✦ ✦ ✦

MOST of the food we eat is imported from England, Australia or America. We get all of Heinz' 57, also a lot of canned goods from California, good, but costly. Ham and bacon are about 80 cents a pound. But eggs are 20 cents a dozen and you can get chickens for 10 cents apiece.

✦ ✦ ✦

House Staff ✦ ✦ ✦ ✦

Sarder Bahadur Sardar Indrah Singh, Director, Indian Steel & Wire Company, Ltd. ✦

CLOTHES are cheap and good. Bought myself a camel's hair overcoat last week for $25, which I couldn't get for $75 at home. Also bought a blue serge suit, two pairs of trousers, a very good material for $22. There are lots of nice things you can pick up cheap, and my wife is a good buyer, as you have to be here. A box-wallah comes along, like a Jew peddler at home. The price he asks will be outrageous, and then you start to bargain. If he asks 100 Rupees, don't pay over 20, that's the rule, and at that you'll get gypped.

✦ ✦ ✦

WE got a very nice Persian rug 5 x 7; 250 Rupees was the starter but we paid 150. We have a good friend here, George Kerns from Canton, Ohio who has been here fifteen years and is wise to all this stuff, so we get the box-wallah to leave the stuff on approval and George tells us what to pay.

✦ ✦ ✦

The People

AS for the owners, (Indra Singh and Sons), Ken, they are just the best people you could ever meet, and what they do for the natives is surprising when you consider that after all they are in business to make money. It's true they do not pay much, from 6 Annas to about 3½ Rupees a day, but if you suggest cutting down labor they say "what will these poor people do." Even after the strike they feel that way about them.

✦ ✦ ✦

MOST of the common labor gets about 18 cents for 8 hours, the skilled labor 30 cents up to $1.00 a day. Rajis in the mill, and servants, about 15 cents a day. The women (Rajis) all wear Saris and some of them are real beautiful. They do all the hard work in the mill, pick and shovel, hod carriers, carry coal in baskets on their heads, and do all the cleaning.

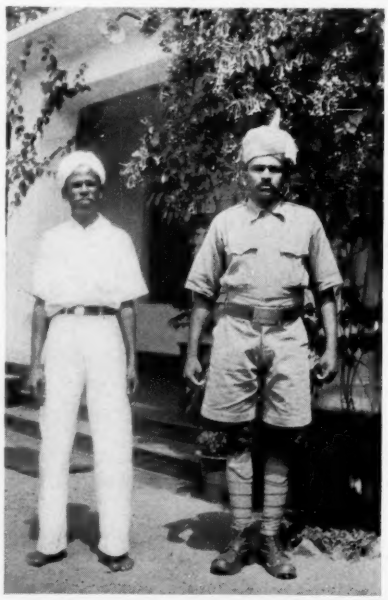
✦ ✦ ✦

Operating the Mill

KEN, you were right about the sull coat, they were letting it dry, and I have a hell of a time to make them keep it wet. I am making up some sprinklers. It was funny the way they swore their wire would not go below 14 gauge. I made some changes in the coating and we went to 16 and then I changed the steel, they had too much manganese in it, and we go to 18 gauge right along. Annealing has dropped from 170 tons to 10 tons a month. We clean rods with 40 pounds of acid. The machinery here is real good, and the Morrison baker is the best I have ever seen.

✦ ✦ ✦

(*Please turn to Page 487*)



Two Members of the House Staff ✦ ✦

Helix Warping In Helical Compression Springs

By D. H. Pletta, Associate Professor of Applied Mechanics, and F. J. Maher, Instructor of Applied Mechanics, Virginia Polytechnic Institute, Blacksburg, Va.

When helical springs are compressed between parallel planes, the load is usually eccentric with the longitudinal axis and the helix, in its deflected position, is no longer truly helical but assumes a sinusoidal or warped shape. The magnitude of the eccentricity and of the warping is a function of the number of turns in the spring.

The research reported on here illustrates this warping for a heavy helical spring, whose length was varied for the series of tests, and it also compares the test results with the theoretical behavior as outlined in a paper by H. C. Keysor. In general, the actual and theoretical behavior were in excellent agreement, thus apparently substantiating the theory. An analysis of the data also emphasizes the need of always assuming some eccentricity of load in practical design, to allow for the lack of perfect concentricity of the individual turns.

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THE tests reported on in this paper were undertaken to determine the correlation between the actual behavior of loaded helical compression springs and the theoretical behavior as outlined in a paper[1] by H. C. Keysor. The theory indicates that helical springs, when compressed between parallel planes, are usually subjected to an eccentric rather than a concentric load and that this eccentricity causes the helix to warp under load. The term warping, as used here, indicates that the deflected helix assumes a sinusoidal shape and does not remain truly helical in its deflected position as the ordinary spring formula leads one to believe. Fig. 1 illustrates this phenomenon. Curve *A* shows the unloaded helix "unwound" and projected on a vertical plane. Curve *B* indicates the deflected position of this helix after application of the load, the solid curve showing actual behavior, and the dotted line showing the commonly assumed position. The shaded area between curves *A* and *B* represents deflection and is replotted in curve *C* for only half of the helix.

✦ ✦ ✦

THE actual and theoretical behavior of compression springs may then be checked by measuring the actual eccentricity of load or by measuring the warping of the helix, and comparing these observations with the theoretical values. The tests as carried out included only observation of helix warping, mainly because apparatus capable of determining warping already existed and because it would have been somewhat difficult to measure eccentricity accurately on the heavy stiff spring used.

✦ ✦ ✦

A SINGLE spring was used in this project. Hence, all variables such as differences in heat-treatment, moduli of elasticity, coil-and-bar diameter, etc., common to any series of separate specimens were eliminated or at least minimized. The bar as coiled consisted originally of about seven turns from each end of which equal lengths were cut as the spring was shortened for the series of tests. The spring had an outer diameter of 6.42 in. and a bar diameter of 1.336 in. A plain carbon steel (0.9 to 1.05 per cent C) was used, coiled hot on a slightly tapered mandrel, and subjected to an oil quench from 1525 F and a subsequent drawing to 850 F.

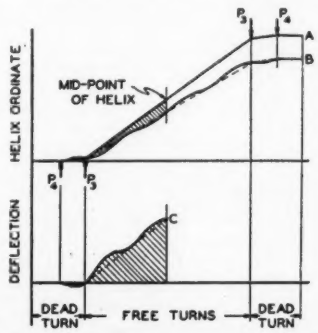

FIG. 1 SINUSOIDAL SHAPE ASSUMED BY DEFLECTED HELIX

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THE spring lengths, as tested, were placed between special helical end blocks mounted to the base and movable head of a testing machine, Fig. 2. Very thin plaster of Paris cappings, as cast in place under load, insured continuous contact for the first 270 deg. of the dead turn. The balance of the apparatus to measure the warping consisted essentially of a collar, concentric with and free to rotate about the lower end block, to which a vertical post was attached. An Ames dial reading to 0.001 in. was fastened to a sleeve which was free to slide up and down the post. A tapered pin, which fits through the sleeve and post simultaneously, could be inserted in any one of a series of holes in the post spaced 1 in. apart. The cantilever arm attached to the lower end of the Ames-dial plunger rested on the top side of the wire of the spring. With this arrangement, it was possible to determine the elevation of any point on the coil to 0.001 in. above a datum for any given load. A subtraction of two successive elevations at any given point gave the net deflection for that increment of load.

✦ ✦ ✦

DURING a test run, readings were taken at points spaced 30 deg. apart along the helix for

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loads of 500 to 8000 lbs. The cantilever arm was used to eliminate the error that could possibly result if points on the outside of the wire had been used. Any twist in the wire, when the coil was loaded, would have caused these points to deflect more or less than the helical axis, whereas any measurement made on a horizontal tangent to the top of the wire would always remain half a wire diameter above the axis. At each load the deflection of the whole spring was also observed by noting the movement of the head of the testing machine.

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AT the 8000-lb. load, the upper and lower split wedge blocks were adjusted so that the deflection of the end of the dead turn (point 13) was

FIG. 3 SPLIT WEDGE BLOCK

reduced to zero relative to its seat. The wedges can be seen in Fig. 2 and are also illustrated in detail in Fig. 3. They resemble a bolt with the circular head of the bolt and washer tapered. Under the 8000-lb. load the two ends of the dead turn closed several hundredths of an inch allowing point 13 to deflect. This movement was reduced to zero by tightening the nut, thus separating the ends of this turn. Various other nonadjustable supports were tried but all of them allowed some deflection due to the localized contact deformation. It was thought best to have this deflection zero in keeping with the theory, but it should be added that the small movement allowed by these other supports was not critical, for the deflections of points along the helix were only slightly affected.

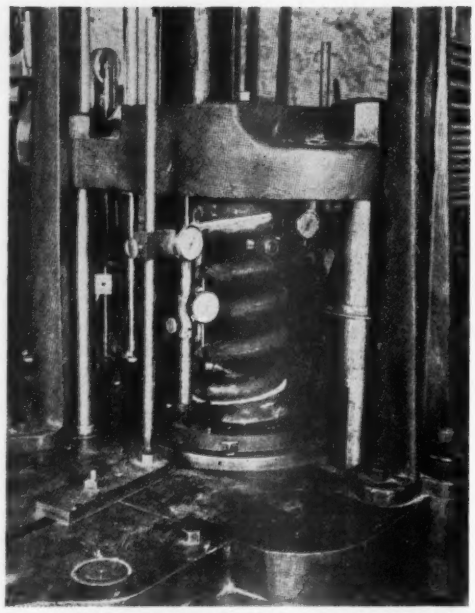

Fig. 2. Method of Mounting Spring Lengths in Testing Machine.

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TABLE 1 indicates the scope and some of the results of the tests. Seven tests were made, the bar length varying from 6 to 3.511 total turns. Three of these lengths

TABLE 1 SCOPE AND RESULTS OF COMPRESSION TESTS ON HELICAL SPRINGS

Test no.	Number of turns—Free*	Number of turns—Active (theoretical)	Number of turns—Excess	Deflection in in.—Actual	Deflection in in.—Theoretical	Variation from theoretical, per cent	Theoretical eccentricity
1	6	4.415	0.415	0.947	0.938	+0.96	0.1171R†
2	4.75	4.194	0.444	0.886	0.892	−0.45	0.0763R
3	3.511	3.979	0.468	0.841	0.846	−0.59	0
4	3	3.399	0.399	0.732	0.722	+1.39	0.1303R
5	2.511	2.079	0.468	0.625	0.634	−1.42	0
6	2	2.371	0.371	0.507	0.504	+0.59	0.2096R
7	1.511	1.079	0.468	0.416	0.421	−1.19	0

* All test springs had two dead coils in addition.
† R = mean coil radius.

were such that the eccentricity of the load was theoretically zero; whereas the others, with the exception of case 2, were such that the eccentricity was the maximum attainable. The theoretical spring deflection was calculated, using a shearing modulus of elasticity of 11,600,000 lb. per sq. in.

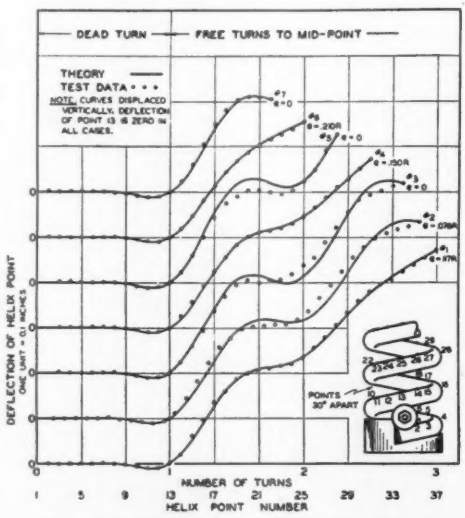
DEAD TURN
FREE TURNS TO MID-POINT
THEORY
TEST DATA
NOTE: CURVES DISPLACED VERTICALLY. DEFLECTION OF POINT 13 IS ZERO IN ALL CASES.
DEFLECTION OF HELIX POINT
ONE UNIT = .01 INCHES
NUMBER OF TURNS
HELIX POINT NUMBER
POINTS 30° APART

FIG. 4 HELIX WARPING UP TO MID-LENGTH OF SPRING

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FIG. 4 shows the helix warping up to mid-length of the spring for the seven tests outlined in Table 1. The other half of the spring should, of course, be identical and tests indicated that it was, but there seemed little need of plotting the curves for the entire spring. The load increment was 7500 lb. The solid line represents theory. No attempt was made to draw a curve through the data points. In four of the tests the correlation between theoretical and actual behavior was almost perfect, whereas in the other three cases it was only fair. There are several reasons why the agreement in these last three cases should not be perfect. The measurement of the deflection on the top of the bar rather than along the neutral axis; the slight rocking of the bar on the split wedge blocks, tending to shorten the spring; the imperfect seating on the helical end seats; and the lack of perfect concentricity for the individual turns of the spring, all tended to modify perfect behavior. The last condition is the most important. It is practically impossible to coil heavy bar so that all turns are identical in diameter, pitch, and concentricity. If only one turn is displaced laterally, an axial load on the spring would be eccentric on this coil. Theoretically the warping decreases near the center of the spring as the eccentricity of load increases. Hence the sinusoidal effect would tend to be damped out especially at the center of the spring. The measured eccentricity or individual turns on the spring amounted to several hundredths of an inch, which corresponded approximately to

$e = 0.02R$ rather than zero. Naturally the magnitude of this error was relatively larger in cases 3 and 5 when the eccentricity should have been zero than in cases 1, 4, and 6 when e was appreciable. Yet in case 7, with $e = 0$ theoretically, the correlation is very good. The reason for this is that this spring had only 1.511 free turns and was therefore too short to be affected by any lateral displacement of a full turn, the short length practically requiring concentricity with itself.

✦ ✦ ✦

THE actual eccentricity of individual turns in cases 3 and 5 was actually determined, but its existence would also be suspected when studying Fig. 5. Here the deflection of individual full turns 30 deg. apart is plotted for cases 1, 3, and 4. The sinusoidal nature of the test data for case 3 is possible only when the load is eccentric. When considering this variation, it should be remembered that the total load on the spring, considered as a concentrated force, acts perpendicular to the diameter through the mid-point of the spring, and that it is generally displaced from the longitudinal axis of the spring.

✦ ✦ ✦

SOME objection to these tests and the theory might be raised because of the difference in the end conditions between these tests and those in commercial springs with their tapered ends ground square. Fig. 6 illustrates helix warping in a commercial spring tested and reported on previously.[2] Here again the sinusoidal effect is quite evident.

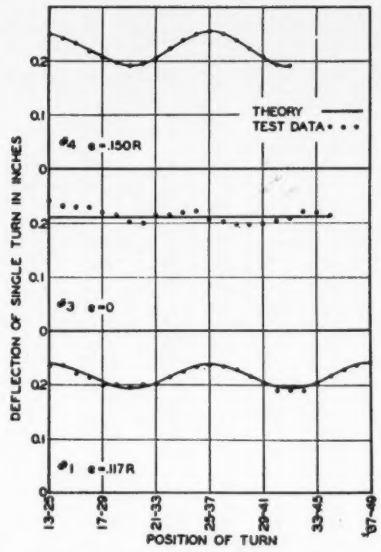

FIG. 5 DEFLECTION OF INDIVIDUAL TURNS 30 DEG APART

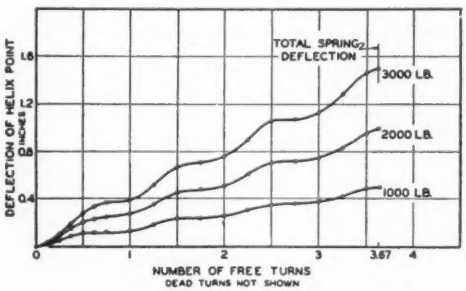

FIG. 6 HELIX WARPING OF A COMMERCIAL SPRING

IT is the belief of the authors that the tests reported in this paper substantiate Mr. Keysor's theory on spring behavior and also emphasize the absolute necessity of always assuming some eccentricity for the load in commercial design to be on the safe side. In other words, an eccentricity based on the envelope of the theoretical cyclic variation in eccentricity,[3] rather than the theoretical eccentricity itself, should be used to allow for the lack of concentricity arising in the practical manufacture of springs. In the commercial design it should, of course, be remembered that eccentric loads produce greater shearing stress than the commonly assumed axial loads.

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[1] **"Calculation of the Elastic Curve of a Helical Compression Spring," by H. C. Keysor.**

Contributed by the Special Research Committee on Mechanical Springs and presented at the Annual Meeting, Philadelphia, Pa., December 4-8, 1939, of The American Society of Mechanical Engineers.

Note: Statements and opinions advanced in papers are to be understood as individual expressions of their authors, and not those of the Society.

[2] **"The Effect of Overstrain on Closely Coiled Helical Springs and the Variation in the Active Coils With Load," by D. H. Pletta, S. C. Smith, and N. W. Harrison, Bulletin 24, Engineering Experiment Station, Virginia Polytechnic Institute.**

[3] **Reference 3, Fig. 7.**

THE WIRE ASSOCIATION

WHAT IT GIVES YOU FOR $10.00 ANNUAL DUES

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For detailed information address

RICHARD E. BROWN—Executive Secretary

300 Main Street, Stamford, Conn.

STATISTICS --- JUNE, 1940

PRODUCTION FOR SALE OF IRON AND STEEL PRODUCTS

AMERICAN IRON AND STEEL INSTITUTE
Capacity and Production for Sale of Iron and Steel Products

June - 1940
PERIOD

		Number of companies	Items	Annual Capacity Net tons	Production for Sale—Net Tons: Current Month: Total	Current Month: Per cent of capacity	Current Month: Shipments: Export	Current Month: Shipments: To members of the industry for conversion into further finished products	To Date (6 Months 1940): Total	To Date: Per Cent of capacity	To Date: Shipments: Export	To Date: Shipments: To members of the industry for conversion into further finished products
STEEL PRODUCTS	Ingots, blooms, billets, slabs, sheet bars, etc.	33	1	xxxxxxx	454,232	xxx	211,236	128,125	2,026,968	xxx	720,553	518,516
	Heavy structural shapes	8	2	5,205,300	234,451	54.9	21,287	xxxxxxx	1,154,775	44.6	98,366	xxxxxxx
	Steel piling	4	3	328,000	16,306	60.6	912	xxxxxxx	79,002	48.4	7,897	xxxxxxx
	Plates—Sheared and Universal	19	4	5,855,450	317,981	66.2	47,394	613	1,721,337	59.1	225,912	10,386
	Skelp	7	5	xxxxxxx	83,214	xxx	14,215	32,780	292,114	xxx	40,632	117,284
	Rails—Standard (over 60 lbs.)	4	6	3,647,600	120,235	40.2	383	xxxxxxx	906,577	50.0	41,873	xxxxxxx
	Light (60 lbs. and under)	6	7	306,800	10,215	40.6	2,188	xxxxxxx	50,783	33.3	15,789	xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	118,000	398	4.1	76	xxxxxxx	16,500	28.1	2,382	xxxxxxx
	Splice bar and tie plates	15	9	1,300,200	41,150	38.6	221	xxxxxxx	314,059	48.6	4,545	xxxxxxx
	Bars—Merchant	35	10	xxxxxxx	352,242	xxx	57,604	26,504	1,939,675	xxx	211,454	150,332
	Concrete reinforcing—New billet	15	11	xxxxxxx	126,031	xxx	22,326	xxxxxxx	560,615	xxx	144,396	xxxxxxx
	Rerolling	18	12	xxxxxxx	14,453	xxx	392	xxxxxxx	68,621	xxx	4,258	xxxxxxx
	Cold finished—Carbon	18	13	xxxxxxx	47,815	xxx	1,429	xxxxxxx	303,303	xxx	6,971	xxxxxxx
	Alloy—Hot rolled	15	14	xxxxxxx	69,590	xxx	7,868	4,070	409,656	xxx	27,530	27,381
	Cold finished	14	15	xxxxxxx	5,884	xxx	261	xxxxxxx	42,633	xxx	1,360	xxxxxxx
	Hoops and baling bands	5	16	xxxxxxx	9,227	xxx	1,369	xxxxxxx	45,637	xxx	4,334	xxxxxxx
	TOTAL BARS	53	17	12,372,465	625,242	61.6	91,249	30,574	3,370,140	54.8	400,303	177,713
	Tool steel bars (rolled and forged)	15	18	110,220	5,864	64.8	462	xxxxxxx	32,882	60.0	2,389	xxxxxxx
	Pipe and tube—B. W.	13	19	1,815,860	92,795	62.3	6,905	xxxxxxx	435,995	48.3	40,217	xxxxxxx
	L. W.	10	20	1,246,340	33,004	32.3	2,442	xxxxxxx	158,327	25.5	17,786	xxxxxxx
	Electric weld	5	21	731,520	26,655	44.4	2,349	xxxxxxx	119,206	32.8	12,591	xxxxxxx
	Seamless	15	22	3,159,840	147,073	56.7	13,918	xxxxxxx	850,703	54.1	87,636	xxxxxxx
	Conduit	6	23	151,145	5,771	46.5	54	xxxxxxx	31,777	42.3	810	xxxxxxx
	Mechanical Tubing	13	24	554,825	19,276	42.3	2,125	xxxxxxx	128,217	46.4	7,559	xxxxxxx
	Wire rods	19	25	xxxxxxx	95,987	xxx	28,360	16,531	487,556	xxx	127,690	79,094
	Wire—Drawn	37	26	2,255,210	110,870	59.9	13,392	594	653,068	58.2	82,327	5,260
	Nails and staples	19	27	1,091,690	53,698	59.9	6,532	xxxxxxx	279,565	51.5	33,352	xxxxxxx
	Barbed and twisted	16	28	438,270	22,785	63.4	6,938	xxxxxxx	101,423	46.5	20,159	xxxxxxx
	Woven wire fence	15	29	772,790	25,404	40.1	232	xxxxxxx	129,323	33.6	1,210	xxxxxxx
	Bale ties	11	30	119,050	7,354	75.3	30	xxxxxxx	30,167	50.9	143	xxxxxxx
	All other wire products	6	31	27,030	1,056	47.6		xxxxxxx	6,225	46.3		xxxxxxx
	Fence posts	13	32	147,485	6,009	49.7	79	xxxxxxx	28,207	38.4	443	xxxxxxx
	Black plate	12	33	653,295	31,666	59.1	11,307	5,221	188,498	58.0	19,175	55,293
	Tin plate—Hot rolled	9	34	1,201,960	38,029	38.6	3,631	xxxxxxx	257,728	43.1	62,560	xxxxxxx
	Cold reduced	10	35	2,930,860	206,134	85.7	35,501	xxxxxxx	1,168,001	80.1	226,569	xxxxxxx
	Sheets—Hot rolled	26	36	xxxxxxx	454,157	xxx	47,955	25,439	2,484,383	xxx	255,772	69,914
	Galvanized	16	37	xxxxxxx	118,155	xxx	11,575	xxxxxxx	618,410	xxx	84,633	xxxxxxx
	Cold rolled	18	38	xxxxxxx	159,680	xxx	8,078	xxxxxxx	1,068,450	xxx	45,341	xxxxxxx
	All other	15	39	xxxxxxx	42,001	xxx	2,020	xxxxxxx	274,593	xxx	12,602	xxxxxxx
	TOTAL SHEETS	27	40	13,255,610	773,993	71.2	69,628	25,439	4,445,836	67.4	398,348	69,914
	Strip—Hot rolled	24	41	3,525,110	116,737	40.4	6,753	12,264	664,320	37.9	38,498	67,531
	Cold rolled	35	42	1,313,360	56,463	52.4	1,583	xxxxxxx	330,632	50.6	8,693	xxxxxxx
	Wheels (car, rolled steel)	5	43	419,035	8,593	25.0	70	xxxxxxx	94,292	45.2	2,332	xxxxxxx
	Axles	5	44	472,280	5,277	13.6	91	xxxxxxx	41,279	17.6	1,718	xxxxxxx
	Track spikes	11	45	327,275	8,284	30.8	125	xxxxxxx	57,476	35.3	2,318	xxxxxxx
	All other	3	46	9,100	284	38.0	-	xxxxxxx	4,813	106.3	-	xxxxxxx
	TOTAL STEEL PRODUCTS	133	47	xxxxxxx	3,802,485	xxx	601,668	252,141	20,657,771	xxx	2,752,775	1,101,691
	Estimated total steel finishing capacity based on a yield from ingots of 68.9 %		48	53,714,800	xxxxxxx	80.5	xxxxx	xxxxxxx	xxxxxxx	73.2	xxxxxxx	xxxxxxx
	Pig iron, ferro manganese and spiegel	27	49	xxxxxxx	448,870	xxx	42,200	145,599	2,547,501	xxx	177,423	651,029
	Ingot moulds	4	50	xxxxxxx	40,966	xxx	359	xxxxxxx	196,562	xxx	1,536	xxxxxxx
IRON PRODUCTS	Bars	10	51	160,600	2,224	16.9	8	275	13,713	17.2	94	1,167
	Pipe and tubes	3	52	109,377	3,373	37.6	81	xxxxxxx	17,613	32.4	541	xxxxxxx
	All other	3	53	71,180	877	15.0	149	267	5,892	16.6	998	1,644
	TOTAL IRON PRODUCTS (ITEMS 51 to 53)	12	54	276,247	6,474	28.6	238	542	37,218	27.1	1,633	2,811

Total number of companies included - 153

Total steel products produced for sale, less shipments to members of the industry for conversion into further finished products: Current month 3,550,344 *N.T.;* 80.5 *% of Finishing Capacity.*
To date 19,556,080 *N.T.;* 73.2 *% of Finishing Capacity.*
The above tonnages represent 68.9 *% of the ingots produced by companies whose products are included above.*

THE WIRE ASSOCIATION 1940 CONVENTION
WILL BE HELD AT CLEVELAND, OHIO, OCTOBER 21-25, 1940
For Full Information Address —
RICHARD E. BROWN, Executive Secretary
Stamford Trust Co. Bldg. Stamford, Conn.

Outstanding Personalities of the Wire Industry

Norton Company Announces Personnel Changes

THE Norton Company Board of Directors announced (on June 24) the election of Harry K. Clark to the office of Vice President and General Manager, and Andrew B. Holmstrom to the office of Vice President and Works Manager.

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THESE appointments were to fill vacancies caused by two resignations. Aldus C. Higgins, President, who also held the office of General Manager, resigned the general managership, and George N. Jeppson, Treasurer and Vice President, who also held the position of Works Manager, resigned from the office of Works Manager. Mr. Higgins will retain the office of President and Mr. Jeppson will retain the offices of Treasurer and Vice President.

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MR. CLARK has been with the company 25 years, having held the positions of salesman, District Manager of the Chicago territory, Sales Manager of the company's plant in Germany, Sales Manager of the Abrasive Division, General Sales Manager, a Director of the company and Vice President. Mr. Clark also is Executive Officer in charge of Norton Company of Canada Limited, a Director of Behr-Manning Corporation of Troy, New York, and a Director of Australian Abrasives (Pty) Limited, Sydney, Australia. He is an active member of the Grinding Wheel Manufacturers' Association and President of the American Supply and Machinery Manufacturers' Association. He holds membership in the American Society of Sales Executives.

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MR. HOLMSTROM has been connected with the company for 20 years, during which time he has had considerable experience as an Engineer and in plant management. After five years in the Norton Plants Engineering Department, 1920 to 1925, he was appointed to the office of Superintendent of Sewers of the City of Worcester, at a time when the city was installing a large Imhoff trickling filter sewage purification plant. When the plant was completed he returned to the Norton Company, later going to England as Resident Engineer of the Norton Grinding Wheel Company Limited at Welwyn Garden City.

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TWO years later he returned to the Worcester plant but in 1934 went back to England as General Manager of the British plant, returning again to America in 1939 to assume the responsibility of Works Manager of the Abrasive Division. He is a member of the American Society of Civil Engineers, Worcester Engineering Society, Worcester Society of Civil Engineers and many other social and civic organizations.

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IN connection with the change, President A. C. Higgins and Treasurer G. N. Jeppson issued the following joint statement:

"We believe that the interests of the Company will be best served by the election to the positions of General Manager and Works Manager of men younger in years but long in training and service of the Company. We realize that younger men must ultimately succeed us and we personally desire to be relieved from the duties and responsibilities of the above offices at this time.

"It has been a time-honored policy of the Company to train young men in the standards and traditions of our Company and in the technique of our business, so that we could promote from among our own people men whom we believe capable of carrying on those standards and traditions which were passed on to us by our fathers. The vigor of Norton Management we believe depends upon this policy of retirement of older men at the proper time and promotion of younger men."

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S. M. Washabaugh, Sales Rep., National Screw & Mfg. Co.

S. M. WASHABAUGH has been appointed sales representative for the National Screw & Mfg. Co., Cleveland. Mr. Washabaugh's territory will be in Pennsylvania and the northern part of Maryland, with headquarters in Williamsport, Pa., where he formerly was connected with Sweet's Steel Co.

Frank L. Driver, President, Driver-Harris Co.

FRANK L. DRIVER was elected president, Driver-Harris Co., Harrison, N. J., at the directors' meeting in June. Other officers elected: Executive vice president and treasurer, **Stanley M. Tracy**; vice president in charge of foreign subsidiaries, **John Drennan**; vice president in charge of sales, **F. V. Lindsey**; vice president in charge of manufacturing operations, **H. D. McKinney**; secretary and assistant treasurer, **Ernest A. Harleman**; assistant secretary, **Mildred W. Clark.**

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R. C. Allen Appointed National Defense Advisor on Manganese Ores

R. C. ALLEN, vice president of Oglebay, Norton & Company, Cleveland, has been appointed advisor on manganese ore to assist Edward R. Stettinius, Jr., director of the raw materials division of the National Defense Advisory Commission.

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SAMUEL H. DOLBEAR of Wright-Dolbear & Co., was named advisor on chromium, **H. K. Masters,** consultant on tungsten and antimony to the strategic minerals group which is headed by **Dr. C. K. Leith** of the University of Wisconsin.

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WALTER S. TOWER, president American Iron and Steel Institute is chief consultant for steel.

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J. R. Penman, Production Manager, Warren Plant, Copperweld Steel Co.

J. RUSSELL PENMAN has been appointed production manager in Copperweld Steel Company's new alloy steel plant in Warren, O. Mr. Penman was previously connected with Central Steel Company, Republic Steel Corp., Steel & Tube Division of Timken Roller Bearing Company and the United States Steel Corporation.

(*Please turn to Page 480*)

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in June 1940 and June 1939
(In gross tons)

	JUNE 1940	MAY 1940	JUNE 1939
Wire rods	28,636	16,796	3,564
Strip steel	14,488	12,324	5,083
Plain, black or galvanized iron or steel wire	13,608	11,587	5,374
Barbed wire and woven wire fencing	3,966	4,038	5,139
Woven wire screen cloth	228	262	149
Wire rope	683	1,065	212
Insulated iron or steel wire and cable—see analysis below			
Other wire manufactures	1,034	1,104	1,059
Wire nails	5,707	3,834	2,035
Tacks	45	57	30
Other nails, including staples	605	554	482
Bolts, machine screws, nuts, rivets and washers	1,675	1,496	719
Total, these 11 classifications	70,075	53,117	23,846

Imports of Iron and Steel Wire Into the United States
(In gross tons)

Concrete reinforcement bars	1	.....	399
Hollow bar and drill steel	32	31	96
Wire rods	78	.....	782
Barbed wire	.....	.....	1,883
Round iron and steel wire	18	1	128
Telephone and telegraph wire	.....	.....	.....
Flat wire and strip steel	101	60	261
Wire rope and strand	56	50	116
Other wire	.....	1	125
Hoops and bands	.....	30	1,849
Nails, tacks and staples	8	12	735
Bolts, nuts and rivets	3	20	3
Total, these 12 classifications	297	205	6,378

Export of Insulated Wire and Cable, June 1940

	Foreign		To U. S. Possessions	
	Pounds	Dollars	Pounds	Dollars
Rubber covered wire	8,838,073	$2,397,425	122,069	$23,668
Weatherproof wire	347,709	73,500	44,977	9,151
Other insulated copper wire	1,314,459	305,785	157,388	30,018
Nickel-chrome electric resistance wire	51,550	59,767	.....	.....
Total, these 4 classifications	10,551,791	$2,836,477	324,434	$62,837

Iron and Steel Exports at Record Levels Imports Lower in June

EXPORTS of iron and steel (scrap excepted) soared to new heights in June when shipments totaled 617,678 gross tons valued at $38,794,157. More than 30 percent larger than the May trade of 471,481 tons valued at $31,217,379, June shipments were three times as great as those of June 1939—189,968 tons valued at $13,789,887.

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OVER the first six months of 1940 exports of iron and steel have been three times as large as in the comparable period of 1939—the 1940 figures being 2,770,614 tons valued at $197,970,212 and those for 1939, 923,275 tons valued at $70,254,297.

SHIPMENTS to Europe, North and Central America and the West Indies, and to the Far East all increased in June as compared with May, but slight losses were shown in the trade with South America and Africa. The trade with Europe, reflecting a marked rise in shipments to the United Kingdom, rose from 192,744 tons in May to 262,007 tons in June, exports to North and South America climbed to 119,420 tons from 80,812 tons, while the trade with the Far East totaled 112,609 tons against 69,338 tons. The 2,100-ton drop in shipments to South America—100,580 tons in June against 102,683 tons in May—and the 2,900-ton reduction in exports to Africa—June 23,062 tons against May's 25,904 tons—were too small to be of consequence as indicating a trend.

June Imports Decline

IN June iron and steel imports (excluding scrap) fell to 5,504 gross tons valued at $530,343 from 7,726 tons valued at $544,608 imported in May. In June 1939 this trade had amounted to 30,050 tons valued at $1,487,504. For the first six months of 1940 the imports of iron and steel products totaled only 38,788 tons valued at $4,499,577—but 23.9 percent in quantity and 44.9 percent in value of the comparable 1939 trade of 162,191 tons valued at $10,026,306.

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Scrap Export Trade in Slight Gain

EXPORTS of scrap — 318,369 gross tons valued at $5,261,321—were slightly increased in June as compared with May — 312,483 tons valued at $5,199,424 — but were far short of the June 1939 total of 398,888 tons valued at $5,692,273. Similarly, six months cumulative scrap exports, although totaling 1,481,105 tons valued at $25,128,578 were substantially smaller than the totals for the comparable period of 1939—1,788,752 tons valued at $26,262,850. Included in the June 1940 exports of scrap are 317,202 tons of iron and steel scrap including the 155,364 tons sent to the United Kingdom, the 56,776 tons dispatched to Japan, and the 55,317 tons taken by Canada, 158 tons of tin plate scrap, 457 tons of tin plate circles, etc., 319 tons of waste-waste tin plate, and 233 tons of terne plate clippings, etc.

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United Kingdom Most Important Purchaser

THE leading market in June was the United Kingdom whose purchases totaled 231,094, including 178,641 tons of non-alloy ingots, 21,249 tons of pig iron, and 13,985 tons of non-alloy other plates. The most important items of Canada's 90,491-ton trade were non-alloy "black" steel sheets, 20,619 tons; skelp, 11,010 tons; non-alloy other plates, 10,291 tons; and plain shapes, 7,741 tons. Tin plate, 4,894 tons; plain shapes, 3,850 tons; and seamless casing and oil-line pipe, 3,666 tons were the chief items in Argentina's varied trade of 38,540 tons. China's trade of 27,129 tons included 8,681 tons of

wire rods, 3,174 tons of tin plate, and 3,023 tons of non-alloy "black" steel sheets. Japan ranked next with a total of 26,668 tons, in which non-alloy ingots, 10,291 tons; wire rods, 8,072 tons; and tin plate, 3,120 tons were the most important.

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Scrap Exports Slightly Up

THE United Kingdom was the largest purchaser of scrap in June taking 155,364 tons of the 318,369-ton total. Japan and Canada were next in line, taking 56,946 tons and 55,362 tons, respectively. Six-months figures show that the United Kingdom has taken 459,449 tons in that period, Japan, 415,016 tons; Italy, 320,923 tons; and Canada 156,516 tons.

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June Imports Lower

THE principal product imported in June was spiegeleisen—its total of 2,260 tons being furnished by Canada, 2,220 tons and Norway, 40 tons. Norway furnished the entire 1,346 tons of ferromanganese, with Canada the sole source of the 643 tons of pig iron received.

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Wood Screws

EXPORTS of iron and steel wood screws during June 1940 totaled 84,914 gross valued at $17,546. Of this total The Philippine Islands took 28,670 gross valued at $7,376; Cuba took 21,300 gross valued at $4,364; Venezuela, 8,258 gross valued at $1,495; Union of South Africa, 8,000 gross valued at $663; Canada, 2,942 gross valued at $538; Mexico, 2,207 gross valued at $386; Chile, 2,000 gross valued at $200; Republic of Panama, 1,760 gross valued at $507; Nicaragua, 1,618 gross valued at $252; Colombia, 1,496 gross valued at $259; British Guiana, 1,425 gross valued at $378; Costa Rica, 1,264 gross, valued at $234; Paraguay, 1,173 gross valued at $170; Bolivia, 1,150 gross valued at $170.

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EXPORTS of brass wood screws during the same period totaled 12,699 gross valued at $5,456. Of this total Argentina took 3,830 gross valued at $1,402; Philippine Islands, 3,228 gross valued at $1,967; Cuba, 2,785 gross valued at $1,278; Ecuador, 1,310 gross valued at $187; Venezuela, 350

TRADE MARK REG. U. S. PAT. OFF.

MICRO-WELD

MICROMETER PRECISION

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MODEL JE—CAPACITY .005 TO .020

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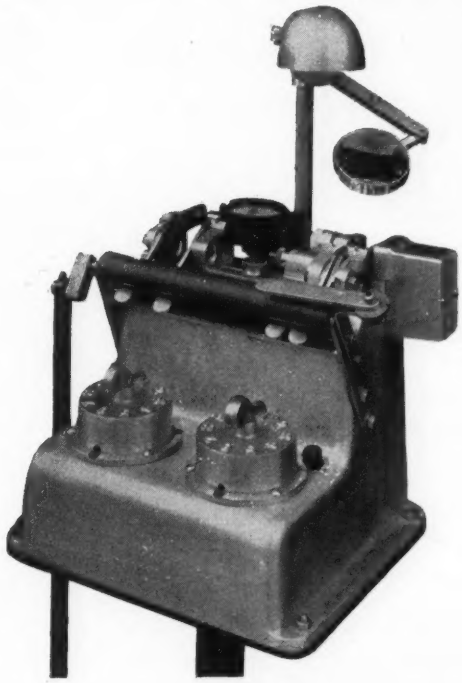

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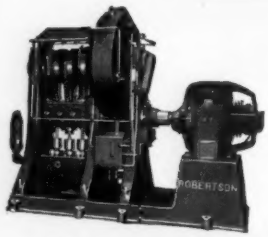

1. Sight gauge showing the flow of oil which is delivered into gear case.
2. Oil filter for filtering oil from oil feed pump.
3. Oil feed pump for gear-drive and all shaft bearings.
4. Timken roller bearings on pinion shaft.
5. Flexible coupling connecting pump and motor.
6. Oil storage tank of large capacity with pump feed to eccentric and main shaft bearings.
7. Bronze bonnets on pump chamber — they will not rust.
8. Solid forged steel pump block with removable bronze valve seats.
9. Deep packing chamber to insure long life of hydraulic packings — easy to get at.
10. Spring-balanced hydraulic safety relief valve of sufficient capacity to take the full capacity of pump without undue increase in pressure.
11. Non-rust steel plungers, ground and polished.
12. Eccentric shaft of steel forging with all bearings bronze-lined.
13. Sight feed oilers for all eccentric and main shaft bearings.
14. Herringbone gear-drive in cast iron oil tight case.

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gross valued at $83; Guatemala, 292 gross valued at $129; Costa Rica, 244 gross valued at $87; Netherlands W. Indies, 198 gross valued at $96; Peru, 150 gross valued at $15; Bermuda, 146 gross valued at $65.

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IMPORTS of wood screws during the same month totaled 222 gross valued at $125 of which Switzerland supplied 202 gross valued at $117 and Canada supplied 20 gross valued at $8.

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Imports of Miscellaneous Items in June

IRON Ore: 162,064 tons (174,563 tons in May) furnished chiefly by Chile, 99,500 tons; Canada, 30,-153 tons; Brazil, 9,000 tons; and Newfoundland and Labrador, 8,900 tons.

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MANGANESE Concentrates: 10-35 percent: None (none). **35 percent plus—Battery grade:** 1,905 tons (685 tons). The Gold Coast sent 1,525 tons and the Union of South Africa sent 380 tons. **35 percent plus — Other:** 48,960 tons (62,089 tons). 15,317 tons came from the Gold Coast, 11,909 tons from U.S.S.R. (Russia), 6,818 tons from the Union of South Africa, and 5,662 tons from British India.

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CARD Clothing: 22,707 square feet, $33,030 (12,586 square feet, $19,427). The United Kingdom was the source of 22,289 square feet, $32,570 and France of 418 square feet, $460.

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WIRE Cloth and Screening: 2,064 square feet (20,020 square feet) all of which came from Canada.

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Western Metal Congress May 19, 1941

AT the last meeting of the Board of Trustees of the American Society for Metals it was voted unanimously to hold the Western Metal Congress and Western Metal Exposition in Los Angeles the week of May 19th, 1941. This will be the fourth Western Metal Congress and Exposition spon-

sored by the American Society for Metals, the previous ones having been held in 1929, 1931 and 1938.

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"THE tremendous increase in industrial activity in the West, together with the extensive growth of the aeronautical industry and the fact that three years will have elapsed since the previous convention, caused the Board to feel that 1941 should be an advantageous and propitious year for another western event", said W. H. Eisenman, managing Director of the Congress, in announcing the decision.

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THE exposition will again be held in the Pan American Auditorium, which proved such an advantageous location and building for the previous show.

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A LARGE number of technical societies having representation on the West Coast will participate in the activities, and will have headquarters at the Biltmore Hotel.

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FLOOR plans for the exposition will be ready for distribution about September first.

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Edward J. P. Fisher

EDWARD J. P. FISHER, formerly Manager, Wire Drawing Machinery Division, Aetna-Standard Engineering Company, Youngstown, Ohio, has recently completed the installation of the first steel wire mill in Newfoundland, having been retained some time ago by the United Nail & Foundry Company, Limited, of St. John's, Newfoundland, to complete the construction of the mill and the installation of the machinery.

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MR. FISHER is now operating this mill, training a local personnel and perfecting mill practice and will probably remain in Newfoundland until November or December to complete the job. A description of the new mill will be published in a later issue of WIRE & WIRE PRODUCTS.

with NEW *PLAYS!*

When Keystone wire starts running the plays, production clicks with a professional smoothness. Many fumbles, losses and penalties in product quality disappear. Consistent gains are chalked up in various departments.

This story sounded too good to many other plants, too — until they ran through some samples of regularly-stocked Keystone wires! Some took us up on our offer to create a special wire for them. In either case, the Keystone UNIFORMITY in tensile strength, analysis, gauge, and finish brings gratifying results. Maybe Keystone wire can help you to a scoreboard lead over competition. Why not find out?

KEYSTONE

STEEL & WIRE CO., Dept. W. PEORIA, ILLINOIS

HIGH CARBON

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LOW CARBON

SAMSON SPRING WIRE
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KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Bright . . . Tinned
Coppered
Annealed
Galvanized

Corrosion Discussed at A.S.T.M. Annual Meeting

THE Eleventh Session of the 1940 A.S.T.M. Annual Meeting held in Atlantic City, N. J., June 24 to 28, was devoted to the subject of corrosion with extensive reports by Committees A-5 on Corrosion of Iron and Steel and B-3 on Corrosion of Non-Ferrous Metals and Alloys, the latter including two appended papers.

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AN important new tentative standard was approved and developed by Committee A-5 covering a test for Uniformity of Coating by the Preece Test (Copper Sulfate Dip) on Zinc-Coated (Galvanized) Iron or Steel Articles. This method is really a combination of the former tests pertaining to iron or steel wire (A 191-38) and steel castings and forgings, gray iron and malleable iron castings (A 208-38 T), but has been extended to apply to hardware shapes, threaded materials, and the like. For a year at least the Methods A 191 and A 208 will be continued.

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REVISIONS of the Tentative Specifications for Electrodeposited Coatings of Zinc on Steel (A 164-39 T), Cadmium on Steel (A 165-39 T) and Nickel and Chromium on Steel (A 166-39 T) were approved providing for inclusion of requirements for a thicker coating class in the zinc, and in the nickel and chromium coatings, and an intermediate thickness of coating in the specifications covering cadmium coatings.

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THE report also discussed the results of the committee's researches involving field tests and included a final report covering total immersion tests in sea water of sheet steel and wrought iron specimens, and tubing, exposed since 1927 at Portsmouth, N. H., and Key West, Fla. Conclusions which the committee in charge felt could be drawn from the results were itemized and included the fact that the spread in time of failure is great and that the difference between different kinds of material is small with respect to the spread in time. The relative order of failure of the different materials is not the same at the two test locations.

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ONE of the most interesting conclusions was that the addition of copper increased the life of all the materials under test with the exception of high-phosphorus steel at both locations and that the open-hearth iron lasted longer than the basic open-hearth steel in both the high- and low-copper groups. The average chemical analysis of the materials indicated that in the copper-bearing materials the copper content was about 0.25.

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MESSRS. N. B. Pilling and W. A. Wesley, The International Nickel Co., Inc., in their paper on "Atmospheric Durability of Steels Containing Nickel and Copper" outlined the results of extended

ANNOUNCING!

A NEW SCIENTIFIC HEAT TREATING METHOD FOR THE CONTINUOUS PATENTING, TEMPERING, AND ANNEALING OF STEEL WIRE, STAINLESS AND OTHER AUSTENITIC STEEL WIRE AND STRIP BY THE TRAUWOOD PROCESS.

OUTSTANDING ADVANTAGES

- Uniformity not obtainable with other methods
- Efficient economical operation
- Faster wire speeds — Greater production
- Accurate control
- Higher physical properties
- Higher fatigue properties
- No surface decarburization
- No scale

The Trauwood Engineering Company

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During the Wire Association Convention, attend the Inspection Thursday afternoon, October 24, and see one of our units in operation.

series of atmospheric corrosion tests, some of which had been under way for 15 years. A general conclusion from this work is that the beneficial effects of nickel upon the weathering resistance of steel increase with increasing nickel content and are enhanced by the addition of optimum amounts of copper. The superiority of nickel-copper steels over copper steels is particularly pronounced they concluded. The effects of manganese, silicon, and carbon contents do not appear to be important but the presence of a moderate amount of phosphorus seems to be beneficial in nickel-copper steels.

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THE report of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys included two appended papers, one by Messrs. F. L. LaQue and G. L. Cox, The International Nickel Co., on "Some Observations of the Potentials of Metals and Alloys in Sea Water." The second paper by W. A. Wesley covered "Controlling Factors in Galvanic Corrosion."

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IT was announced in the report that in cooperative work with other committees and with the Joint Committee on Exposure Tests of Plating on Non-Ferrous Metals proposed specifications for electrodeposited coatings of nickel and chromium on copper and copper alloys, and on zinc and zinc alloys had been prepared and would probably be submitted to the Society for approval in the near future.

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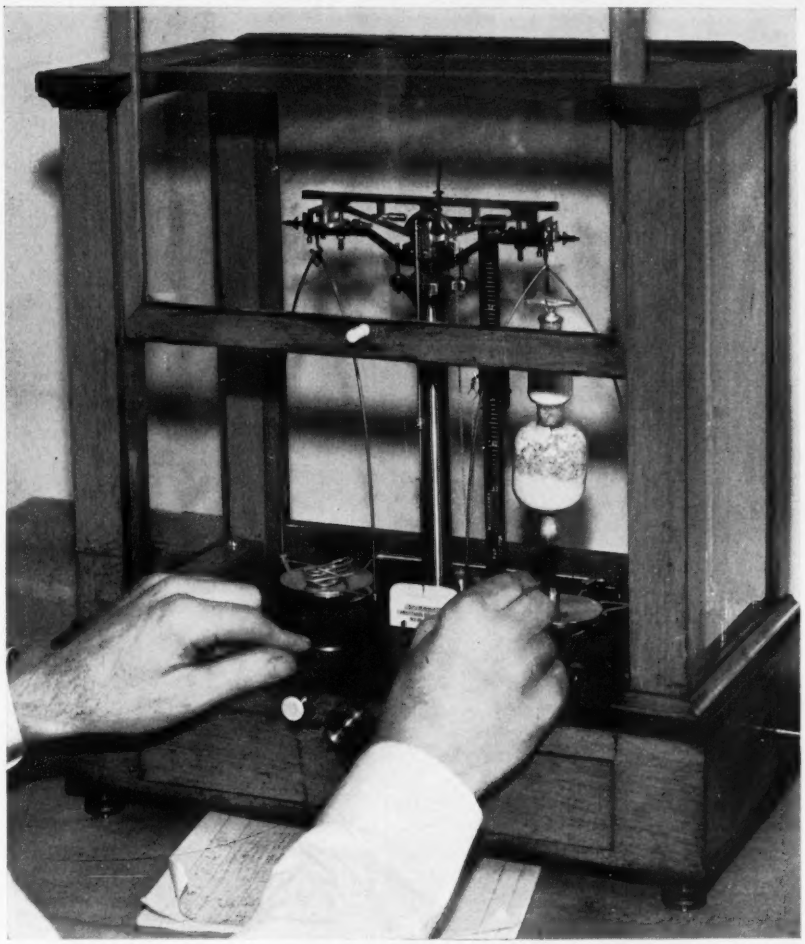
DR. William Blum, National Bureau of Standards, in presenting a brief report of the Joint Committee on Exposure Tests of Plating on Non-Ferrous Metals stated that the outdoor tests of electroplated nickel and chromium coatings on steel and non-ferrous metals were practically completed, the results having been published as Research Paper RP1293 by the Bureau. Copies of this report are available in separate pamphlet form at a nominal charge. As a result of the committee's work proposed specifications were developed as referred to above in the discussion of the work of Committee B-3.



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Continental has trained metallurgists and technical men specializing in wire manufacture. Their business is to study your special needs and problems in wire. They work with the product itself and with your engineers or production men. They find or produce the wire to meet exacting specifications in analysis, temper, finish, etc. Frequently they can point the way for you to get faster work, fewer rejections, lower costs, and a better, more dependable product. Continental furnishes wire in many different shapes, gauges and finishes. See what you can save with Continental wire, write—

CONTINENTAL STEEL CORP., General Offices: Kokomo, Indiana

Plants at Canton, Kokomo, Indianapolis

CONTINENTAL WIRE

Outstanding Personalities of the Wire Industry

(*Continued from Page 473*)

Claire C. Balke Returns to Fansteel

CLAIRE C. BALKE has rejoined the research staff of Fansteel Metallurgical Corporation, North Chicago, Illinois, to participate in important studies in the powder metallurgy of tantalum, tungsten, columbium, molybdenum, other metals, and refractory metal carbides. Mr. Balke is the son of Dr. C. W. Balke, well known authority on rare metals and earths, who has been associated with the Fansteel organization since 1914. The younger Balke came to Fansteel immediately after graduation from the University of Illinois and worked in the research laboratory until August 1, 1939, when he became instrumental in the establishment of a department of powder metallurgy at Stevens Institute of Technology, Hoboken, New Jersey.

MR. BALKE'S return to Fansteel is part of a major program of technical development, plant expansion and equipment improvement, in which more than $100,000 is being expended in new buildings and equipment alone. This program has become necessary because of increased demand for tantalum acid proof equipment in the chemical industry, rare metal wire, sheet and electrical contacts in the electrical and communication industries, and tantalum-tungsten carbide cutting tools and wire drawing dies, as well as new combinations of powder metallurgy products which seem destined to become increasingly important in modern manufacture.

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A. Oakleigh Bush, Asst. Chief Sales Engineer, Abrasive Division, Norton Company

A. OAKLEIGH BUSH has been appointed assistant chief sales engineer of the Abrasive Division of Norton Company, Worcester, Mass. Mr. Bush has been with Norton Company for about 16 years, first in the electric furnace plant at Niagara Falls and then in the Research and Sales Engineering departments at Worcester. In 1937 he was transferred to the Norton London office and later to the English plant at Welwyn, becoming its acting general manager in 1939. He returned to Worcester about a month ago with other American members of Norton Company's European staff.

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American Steel & Wire Personnel Changes

CHANGES in operating personnel, announced by American Steel & Wire Co. The shifts will become effective September 1.

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HARRY H. LUMLEY, operations manager of the Duluth district, is being transferred to the Chicago district as assistant manager of operation. **B. E. Pheneger,** general superintendent of Cleveland Coke Works and Central Furnaces & Coke, will succeed Mr. Lumley as Duluth district man-

FOR THE *TENTH TIME* ON OCT. 21, 1940 —
THE WIRE ASSOCIATION
WILL BE ASSEMBLED IN ANNUAL MEETING —
"to improve production methods and afford a clearing house for ideas ✦ ✦ ✦ ✦ ✦ and to maintain friendly relations among members."

▲ ▲ ▲

REACH THIS MARKET —
THE SPECIAL CONVENTION ISSUE OF
WIRE AND WIRE PRODUCTS
WILL CARRY PREPRINTS OF ALL PAPERS TO BE PRESENTED AND DISCUSSED AT THIS MEETING

▲ ▲ ▲

YOUR USE OF ADVERTISING SPACE IN THIS SPECIAL OCTOBER ISSUE WILL RESULT IN SALES OF YOUR PRODUCT, EQUIPMENT, SUPPLIES OR SERVICES.

RESERVE YOUR SPACE AT ONCE
WRITE

WIRE AND WIRE PRODUCTS
300 MAIN ST.,
STAMFORD, CONN.

ager, and **H. A. Byrns,** superintendent of blast furnaces at Duluth, will become general superintendent of Cleveland Coke Works and Central Furnace & Docks. **James A. Gates,** general foreman at Central Furnaces & Docks, has been appointed superintendent.

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J. C. WITHERSPOON, assistant general superintendent at Donora Steel & Wire Works, is being transferred to the steel division at Duluth, where he will be general superintendent, and Harold Cope, superintendent of blast furnaces at Donora, is being appointed general superintendent of Donora Steel & Wire Works. **H. O. Johnson** will succeed Mr. Cope, and **H. B. Burke,** foreman at Donora blast furnaces, will replace Mr. Johnson as general foreman of that department.

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Personnel Changes At Carnegie-Illinois Gary Works

CARNEGIE - ILLINOIS Steel Corporation announces the following personnel changes at its Gary works:

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O. W. BALDWIN has been appointed assistant chief chemist. He was first employed at Gary works as a blast furnace iron chemist in the chemical laboratory in 1925 and served there in various capacities until the present time. Mr. Baldwin was turn foreman at the time of his appointment.

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J. N. QUINLAN was made division superintendent of the west mills after serving as assistant division superintendent of these mills since 1938. He began as a stores clerk in 1907.

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H. H. BUSHONG comes to Gary works as first assistant division superintendent of the west mills from McDonald mills, Youngstown, Ohio, where he had been superintendent since 1935. Before his appointment here Mr. Bushong held various positions in the corporation's Youngstown district operations.

S. R. STANIER receives the post of second assistant division superintendent of the west mills. He came to Gary works from the Gary sheet and tin mills in 1936 as assistant superintendent of the merchant mill. Mr. Stanier was superintendent of the merchant mill strip mills at the time of his present appointment.

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J. V. Cremonin Appointed Export Manager, Broden Construction Co., Cleveland, Ohio

THE Broden Construction Company announces the appointment of **J. V. Cremonin** as export manager with headquarters at 21 State Street, New York, N. Y.

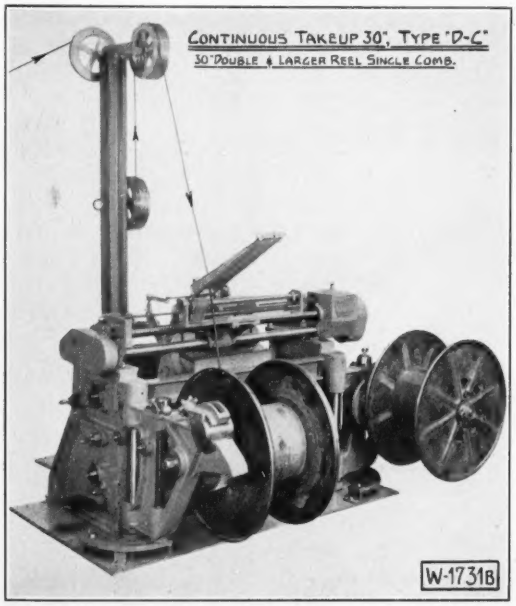
✦ ✦ ✦

MR. CREMONIN is a graduate electrical and mechanical engineer, and has been active in the foreign field for many years. He has made many trips to European countries, as a result of which he has made a thorough study of market possibilities and this, together with his knowledge of several languages, enable him to render excellent service to the customers of this company.

THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.



Reels Shown in Running & Unloading Positions

Continuous Takeups Type D. C.

Designed for continuous constant-tension reeling of product as delivered to takeup by processing equipment. Commonly employed in Continuous Vulcanizing or Tubing process. Speed variation by hydraulic control synchronizes reeling speed to capstan haul rate. Transfer of product from full to empty reel occurs at full speed. Removal of filled reel and replacement by empty reel is rapidly accomplished. Rugged construction with anti-friction bearings throughout.

War Contracts

(Continued from Page 466)

tion, this contract procedure in time of war must strive to provide an effective stimulus for production and to protect the interests of the Government. The forms here described aim to accomplish these ends.

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IN connection with the data presented in the article on **"War Contracts"** by Lieut. Col. John P. Dinsmore further information published under the title **"Materials Standards in National Preparedness"** by Lieut. Col. William C. Young, Planning Branch, Office of the Assistant Secretary of War, as presented at the Forty-Third Annual Meeting of the American Society for Testing Materials at Atlantic City, New Jersey, June, 1940, will be of interest.

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IN this article Colonel Young states:

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Standards for Materials

THE question of materials standards is a highly important one in the determination of what is wanted. Whether the article of equipment be an airplane, a tank, an anti-aircraft gun, cloth for uniforms, or field mess equipment, the materials used must insofar as possible be commercially available in quantity. Even armor plate is not made in army arsenals but is a commercial product. If the best material is not so available, then the requirement must provide for substitute material. In some cases the strict performance requirements for distinctly military requirement are such that special materials are required, and sometimes treatments not used normally by industry are required. The positive policy of the War Department is to adhere insofar as possible to the basic requirement of commercial availability of materials. Before any design of equipment is approved, a statement is required of the supply branch of the War Department charged with its development as to the materials in it, which would be difficult to obtain either because of quantity or processes involved in manufacture.

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THERE are some 660 specifications listed in "The Index of U. S. Army and Federal Specifications used by the War Department" for materials, many of which are no doubt of interest to the American Society for Testing Materials. (The Index may be obtained from the Superintendent of Documents, Washington, D. C., at a cost of 25 cents.) The great majority of U. S. Army specifications are not for sale but are furnished to bidders and prospective contractors in connection with purchases. These are developed by the supply branches of the War Department, each being assigned the materials in which it has the greatest interest.

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IN the course of their preparation, comments are obtained from interested industries as to their satisfactoriness wherever possible. These comments may be requested from companies, technical societies, or through advisory committees consisting of representa-indication of marking an epoch tives of industry. For example, the Signal Corps regularly consults the manufacturers, the Ordnance Department secures comments on its metal specifications through a

THE ANNUAL MEDAL AWARD

OF THE

WIRE ASSOCIATION

FOR THE MOST MERITORIOUS PAPER ON
WIRE MANUFACTURE OR FABRICATION DURING THE YEAR

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Meeting at Cleveland, October 21-25, 1940.

✦ ✦ ✦

FOR 1940 and subsequent years a medal will be awarded in each of the two major divisions of the activities of the Association, to the papers coming nearest to the requirement set forth above.

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CONSIDERATION for the Medal Awards is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

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SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Programme Committee of the Wire Association.

✦ ✦ ✦

ALL papers submitted become the property of the Wire Association, and the Board of Directors constitutes the Committee on Awards.

✦ ✦ ✦

ADDITIONAL information may be obtained by addressing:

RICHARD E. BROWN,

SECRETARY, THE WIRE ASSOCIATION

STAMFORD TRUST CO. BLDG., STAMFORD, CONNECTICUT

metallurgical advisory board from industry.

✦ ✦ ✦

IN preparing U. S. Army specifications reference is made to A.S.T.M. standards or other nationally recognized specifications which may cover the same materials. Since these standards or specifications do not always contain the exact requirements nor the type or quality of material which the U. S. Army specifications intend to cover, it is not possible for the War Department to adopt these standards **in toto.** It does, however, attempt to include all of the essential technical requirements and methods of test found applicable in order that the specifications so promulgated by the War Department may be in harmony with best commercial practice. In this way, the U. S. Army specifications will have embodied in them all of the best thoughts as regards technical details and requirements and at the same time keep abreast of industry in its standardization program.

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IN addition to technical details which are applicable to the War Department only, the U. S. Army specifications must cover other details such as rules regarding inspection, grading, and marking. It is also necessary that the War Department exercise complete control over its specifications in order that revisions may be readily made and special conditions imposed that are required for War Department purchases.

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THERE are three other types of specifications used by the War Department in addition to those of the U. S. Army, namely, Tentative Specifications, Federal Specifications, and AN-Aeronautical Specifications.

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TENTATIVE specifications are used by the supply branches of the War Department: first to try them out in actual purchase, to determine satisfactoriness of the specification; and second for nonrecurring purchases of material or equipment. These specifications do not bear the same numbering series as the formal U. S. Army specifications, nor are they included in the Index of U. S. Army Specifications.

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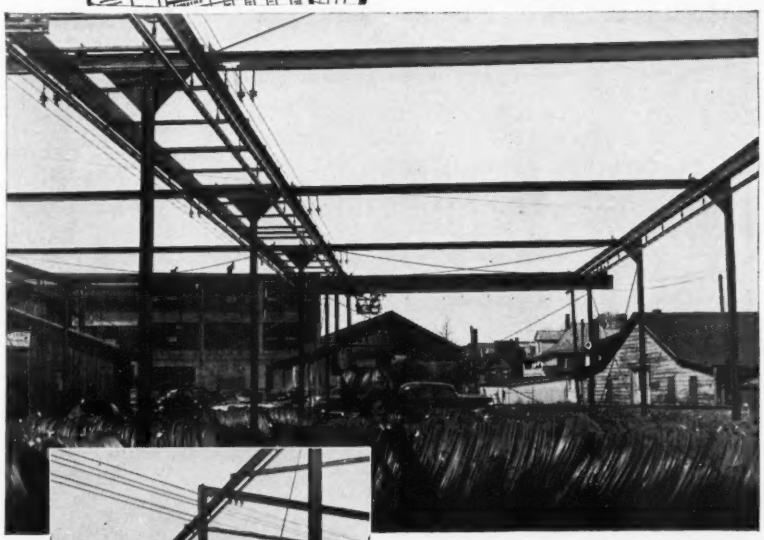
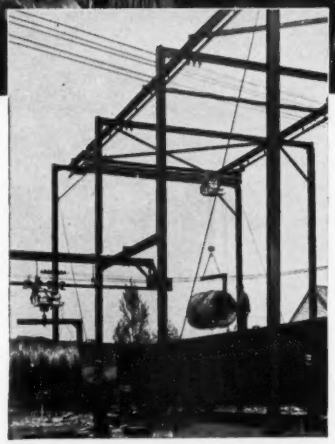
FEDERAL Specifications for use of all Federal Departments and agencies are prepared by the Federal Specification Technical Committees consisting of representatives from the interested departments working under the direction of the Federal Specifications Executive Committee. The War Department is represented on 65 of these 70 Federal Committees. Proposed Federal Specifications are coordinated with industry by the committee, and with all Federal Departments through the Federal Specifications Executive Committee. This series of specifications also follows industrial practice whenever possible. U. S. Army specifications are not prepared for materials covered by Federal Specifications.

Make your plans now to attend The Annual Wire Association Convention, Cleveland, O., Oct. 21-25, 1940.

"Saves 32c per ton!" in handling cost - - -





Unloading and storing coiled rod from box cars formerly cost 40c per ton and required 5500 sq. ft. of warehouse space.

Now, raw coils are unloaded from gondolas, stored outside and handled through pickling to punches and cold-headers at 8c per ton.

A Clear Saving of 32c per Ton Made Possible by Overhead Handling

Innovations, such as a turntable for transferring coils between hoists, develop in conference with American MonoRail engineers.

AMERICAN MONORAIL CO.

13117 ATHENS AVE., CLEVELAND, OHIO

A Review of Recent Wire Patents

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

No. 2,206,064, METAL TREATING PROCESS, patented July 2, 1940 by John S. Thompson, Detroit, and Harold F. Bristol, Highland Park, Mich., assignors to The Patents Corporation, Detroit, Mich.

The process, in this patent, comprises treating the surface of iron, steel or zinc wire and the like with an insoluble chromate in finely divided form, drying if necessary, removing the excess chromate and thereafter applying a coat of one of the group consisting of paints, enamels and lacquers.

✦ ✦ ✦

No. 2,206,085, SCREW, patented July 2, 1940 by Joseph F. Fieg, La Grange, Ill., assignor to United Screw and Bolt Corporation, Chicago, Ill., a corporation of Ohio.

In this patent, the invention lies in the head and slot of the screw, the slot having opposite eccentric segmental walls.

✦ ✦ ✦

No. 2,206,246, MEANS FOR WINDING FLEXIBLE MATERIALS ONTO SPOOLS, BOBBINS, OR THE LIKE, patented July 2, 1940 by Leonard Charles Bannister, St. Helen's and Waldo John Clements, Prescot, England, assignors to British Insulated Cables Limited, Prescot, England, a British company.

A counterbalancing weight is provided, forming a biasing means, which weight acts on the winding spool carriage to resist downward movement of the spool under gravity, so that the latter takes a position of equilibrium depending upon the weight of wire wound upon the spool. Means is also provided for varying the speed at which the spool is rotated in dependence on the position of the spool carriage with relation to the main frame, the whole being arranged as means for rotating the spool at a progressively decreasing speed as the amount of material wound thereon increases.

✦ ✦ ✦

No. 2,206,627, APPARATUS FOR COILING WIRE, patented July 2, 1940 by Walter Borkey, Hagen, Westphalia, Germany, assignor to Rendan Holdings Limited, Guernsey, Channel Islands.

The assembly includes a former consisting of end supports and a plurality of members carried thereby to form a cage-like device round which the wire is coiled, one of the members being formed as a comb for spacing the wire turns and a clamp for removably clamping the turns in the comb, the former being collapsible to permit of the removal of the comb with the coil clamped therein.

No. 2,207,090, COMPOSITE ELECTRIC CABLE, patented July 9, 1940 by Irving W. Edwards, Detroit, Mich.

A three-wire cable is provided, comprising a strip of relatively high tensile strength having at least one ridge longitudinal of each of its flat surfaces, and semi-cylindrical grooved wires of relatively softer metal but greater electrical conductivity helically and interlockingly laid over the strip, the strip being twisted about its axis.

✦ ✦ ✦

No. 2,208,035, SPRING STRUCTURE, patented July 16, 1940 by Edward P. Krajewski, Detroit, Mich., assignor to L. A. Young Spring & Wire Corporation, Detroit, Mich.

Helical coil springs are assembled and locked into assembled relation, the locking being effected by cross wires having spaced apart loop-like offsets, in pairs, spaced by short reaches, with the springs having loop-like hooked offsets, engaging the cross wires.

✦ ✦ ✦

No. 2,208,052, MANUFACTURE OF RESILIENT SPRINGS, patented July 16, 1940 by Robert C. Pierce, Niles, Mich., assignor to National Standard Company, Niles, Mich., a corporation of Michigan.

The method of making this resiliently extensible spring, comprises forming an open-mesh braid of wires passed alter-

NATIONAL RUBBER MACHINERY CO.
AKRON, OHIO
Manufacturers of Equipment for the Rubber, Wire, Wire Rope, Electric Cable, and Plastic Industries.
Improved Insulating Machinery for Western Electric Continuous Vulcanizing Process.
Plants: Akron, Ohio; Columbiana, Ohio; Clifton, N. J.
Main Office: Akron, Ohio
The Bawden Machine Co., Ltd., Toronto, Ont., Canada
David Bridge & Co., Ltd., Manchester, England

Manufacturers of materials, tools and equipment for wire drawing and forming plants are constantly making improvements and additions to their lines. If you do not find the product or service in which you are interested, additional information will be supplied promptly. Simply address:

WIRE & WIRE PRODUCTS
Stamford Trust Co. Bldg.,
300 Main St. Stamford, Conn.

New Catalog on Thermocouples

A 40-page catalog, described as the first complete publication on thermocouples issued by Leeds and Northrup Company, not only lists a comprehensive line of assemblies with their parts and accessories, but includes information of general usefulness on the correct choice of couples. Tabulated in easy-to-use form, this information should be helpful to users as a guide to the best choice of couple for the application at hand. Illustrations and listings are so arranged that parts and accessories, as well as complete assemblies, are easily identified.

✦ ✦ ✦

A COPY will be sent promptly to anyone who asks Leeds and Northrup Company, 4934 Stenton Avenue, Philadelphia, Pa., for Catalog N-33A (6) — "Thermocouples".

nately over and under each other diagonally across the braid and formed at the edges of the braid with reverse bends, and compressing the bends heavily enough permanently to "set" them, whereby the braid forms a spring structure whose resilience is the sum of the spring action of all of the "set" bends.

✦ ✦ ✦

No. 2,208,832, ELECTRIC CABLE, patented July 23, 1940 by Charles James Beaver, Bowdon and Edward Leslie Davey, Timperley, England, assignors to W. T. Glover & Company Limited, Manchester, Lancashire, England, a British company.

High voltage cables are provided, in which a helical wrapping of paper strip metallised on one side encloses the conductor with the metallic surface of the metallised paper in contact therewith, the adjacent turns of the helix of metallised paper overlapping and the metallic surface terminating short of the overlapping edge of the paper leaving a non-metallised border between the overlapping edge and the termination of the metallic surface.

✦ ✦ ✦

No. 2,208,897, WIRE COVERING DEVICE, patented July 23, 1940 by Stuart M. Dockerty, Corning, N. Y., and Otis W. Wiley, Port Allegany, Pa., assignors, by mesne assignments, to Owens-Corning Fiberglas Corporation, a corporation of Delaware.

Air borne fibres are collected as a felted sheet which is wrapped around the wire conductor, drafted longitudinally of the wire conducted finally spun into contact therewith.

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No. 2,208,963, DEVICE FOR WINDING INSULATING MATERIAL ON CABLES, patented July 23, 1940 by Edward M. Diehl, Bath, Pa.

This device is adapted to wind insulation tapes about wire cables for renewing worn out or defective insulation.

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No. 2,209,924, PASSIVATION OF STAINLESS STEEL, patented July 30, 1940 by Ralph W. E. Leiter and Joseph Winlock, Philadelphia, Pa., assignors to Edward G. Budd Manufacturing Co., Philadelphia, Pa., a corporation of Pennsylvania.

In order to render the steel corrosion proof against sulphuric acid, the inventors subject the steel to contact with an agent consisting of a dilute aqueous solution of sulphuric acid until a smudge is produced on the surface of the metal, terminating the acid treatment, and thereafter exposing the surface of the metal to an oxidizing medium to produce an oxide protective surface proof against attack by sulphuric acid other than concentrated fuming sulphuric acid.

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No. 2,209,928, ELECTRICALLY INSULATING COMPOSITION, patented July 30, 1940 by Paul Nowak and Hermann Hofmeier, Berlin-Charlottenburg, Germany, assignors to General Electric Company, a corporation of New York.

Wire cable insulation is provided, consisting of an oil-, water- and ozone-resistant composition comprising the reaction product of a mixture containing polymerized chloroprene, polymerized acrylic acid derivative and a vulcanizing agent, the polymerized chloroprene increasing substantially the compressive strength of the composition.

Farval Dualine Jr. Centralized System of Lubrication

DUALINE Jr. is described as a new, small Farval centralized system of lubrication, providing suitable distribution of either oil or grease to any number of bearings on smaller machines. Farval Jr. embodies the principles of the Dualine Centralized System which has been used for the past 12 years on machines in all types of heavy industries.

Make your plans now to attend The Annual Wire Association Convention, Cleveland, O., Oct. 21-25, 1940.

THE folder says that Dualine Jr. systems will reduce labor of oiling; eliminate waste of lubricant; increase production; reduce repairs and maintenance and prolong life of equipment. Descriptions are supplemented by photographs and schematic drawings.

THIS *New Booklet*
GIVES A CLEAR, CONCISE
UNDERSTANDING
OF OVERHEAD
MATERIALS HANDLING

In 5 minutes time this 12-page booklet conveys valuable information on materials handling that can result in great savings to your company, the amount depending upon conditions involved. Thousands of dollars are being saved yearly by many companies with Cleveland Tramrail.

Numerous pictures and drawings give you the elements of Tramrail materials handling equipment and illustrate typical plant layouts of actual applications. This booklet starts your train of thought and carries you through the steps necessary to determine where and what equipment might be used profitably.

Write today for Booklet 2004-A on your company letterhead.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
1141 Depot Street Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT
Other products: CLEVELAND CRANES and STEELWELD MACHINERY

Demonstration of Heat Treatment On the Properties of Steel Springs

IN order to show how research in the steel industry contributes to the quality and performance of steel products, the new Hall of Research of the United States Steel Subsidiaries building at the World's Fair in New York for 1940 presents an actual demonstration of the effects of chemical composition and heat treatment upon the properties of steel.

FOR the purpose of the demonstration, high and low carbon helical compression springs, similar to valve springs, are used. The springs are treated in pairs—one high carbon spring and one low carbon spring being treated simultaneously. An interesting sidelight of the demonstration is the production of the sample springs by a modern coil spring making machine installed in the exhibit booth.

IN the demonstration the two coils are subjected to a standard heat treating operation consisting of raising them to 1500° F in a bath of molten salt, cooling them rapidly in oil, and then tempering them at 700° F in another salt bath after rinsing off the oil and drying. After the heat treating operation has been completed, the two springs are submitted to a load test of 140 pounds, a pressure sufficient to effect full compression of each spring. Following the load test, the low carbon spring, which has been overstressed and permanently deformed by the 140 pound load, is almost an inch shorter than it was before heat treating. The high carbon spring, however, because of its greater strength and elasticity, returns to its original length.

✦ ✦ ✦

THE result of the test directly illustrates the fact that the difference in the chemical composition of the high carbon spring and the low carbon spring produced important differences in the performance of the two springs after each had been subjected to identical heat treatment. In this manner the demonstration shows the important role of research in steelmaking, for only through intensive research has it been possible for scientists to coordinate composition and heat treatment and thus impart to steel the properties which make it suitable for new applications.

✦ ✦ ✦

DURING the heat treating demonstration experienced steelmen explain the operations and the fundamental principle underlying the heat treatment of steel—the change in the structure of steel from alpha iron to gamma iron as the steel is heated through its critical temperature. The basic importance of this transformation lies in the fact that it enables the steelmaker to harden and otherwise control the properties of steel by heat treatment to an extent impossible with any other metal or alloy.

Syncro type "D" machines now give you

wider range, greater simplicity and economy

Recent improvements in the Syncro type "D" wire drawing machine give the following results.

- Power increased to 125 H.P. — Maximum entering size is now ¼" rod.
- Block faces equipped with easily replaced blue steel tires.
- A small, movable tallow box reduces waste.
- Frictionless piston ring seal prevents oil and solution from mixing.
- Single or double faced capstans available. Double faced capstan provides two operating speeds.
- Spooler is driven smoothly and without starting or stopping shocks by a Syncro Magnetic Slip Clutch.
- Spooler is equipped with expanding arbor which locks reel on arbor and thus eliminates vibration.

Write for complete details.

Syncro Machine Company

Graybar Bldg., New York — McCormick Bldg., Chicago

Represented in Canada by — Canadian Elevator Equipment Co., Ltd., Toronto.

NEW 99% SOAP INSURES CORRECT LUBRICATION

Nopco's new Soap LX has been prepared especially for the dry drawing of steel wire. Its superiority is due to its actual soap content—99% active dry soap.

Because of this high pure soap content, Nopco Soap LX possesses plus values that will effect economy in your drawing operations.

Free from glycerine, salt or fillers of any kind, Nopco Soap LX insures correct lubrication with longer die life, better finish and higher yields per pound of soap.

Write for a Technical Data Bulletin or better still, order enough for a trial—see for yourself.

NOPCO

NATIONAL OIL PRODUCTS CO.

HARRISON, N. J.

BOSTON • CEDARTOWN, GA. • CHICAGO • SAN FRANCISCO

STEEL REELS AND DRUMS

for

WIRE AND CABLE INDUSTRY

R.B. HAYWARD CO.

1714 Sheffield Ave. Chicago, Ill.

On the Road to Mandalay

(*Continued from Page 468*)

THE galvanizing was the poorest I have ever seen, and at last I tore it all out and rebuilt it, and added more take-up blocks. The production has gone from 8 tons to over 20, and I will get it to 40 before I get through. But it is tough when you have all green men on something new.

✦ ✦ ✦

OUR rod mill makes about 200 tons, rods, concrete bar, and merchant shapes. Wire mill 60, but can make 100, nail mill 40, but can make 60, galvanizing was 10, but will be 35 to 40, as we have to make 600 tons of barbed wire a month. See if you can get me some Swift's Mohawk soap. Our soap is lousy and I can't find anything good over here.

✦ ✦ ✦

WE had to intern the Germans who were running the rod mill. They were a pig-headed bunch and wouldn't teach the Indian boys anything, so I had to take hold, and I think I did pretty well. These Indian boys were pretty good, too, considering everything. I was too busy to think of anything for a while, but now we have got three Belgians for rollers and I can breathe again.

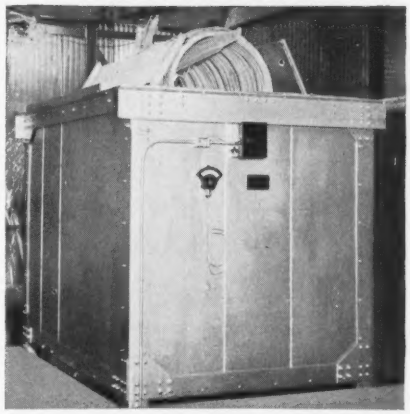
✦ ✦ ✦

Heat Treatment of Springs

(*Continued from Page 486*)

SPECIAL equipment has been installed to enable the visitor to observe the moment at which the transformation from alpha iron to gamma iron takes place in a piece of electrically heated steel wire. The path of the beam clearly indicates that when a piece of steel passes through its critical temperature on heating, it actually contracts momentarily because the transformation absorbs heat; the reverse action takes place in cooling, that is, heat is evolved on passing through the transformation temperature. The absorption of heat on heating and the evolution of heat on cooling can actually be seen by watching the changes in the color of the electrically heated wire.

Cut ROD BAKING TIME AND COST... with CARL-MAYER HI-SPEED TRADE MARK Rod Baker



Carl-Mayer Indirect Hi-Speed Rod Baker in Prominent Steel Company of Canada.

Another Baker Ordered

(BY PRECEDING STEEL CO.)

BECAUSE OF FOLLOWING RESULTS ON FIRST BAKER

Carl-Mayer HI-SPEED Indirect Pit Type Rod Baker . . . . Baker Temperature, 500°F. . . . . Load per Pin, 2100 lbs.

LOW CARBON .15 - .20	HI-CARBON .4 - .7
7 Minutes per pin	9 Minutes per pin
7 " " "	10 " " "
6 " " "	11 " " "
8 " " "	10 " " "
6 " " "	9 " " "

FUEL REDUCTION 50% OVER PREVIOUS PERFORMANCES BY TEST

Inspect above installation . . . Check results yourself . . . Company name on request.

CARL-MAYER PATENTED BLOW-OFF FEATURE removes moisture without rolling, bumping or agitating the coils . . . Write for complete data.

OVER 20 YEARS EXPERIENCE

THE CARL-MAYER CORPORATION

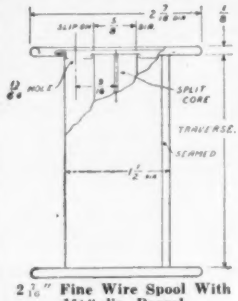
3030 EUCLID AVE.

CLEVELAND, O.

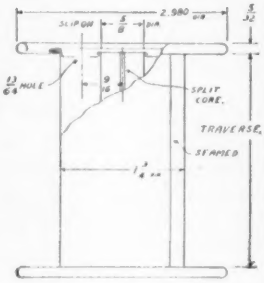
THIS ALL-METAL SPOOL CAN NOT TRAP FINE WIRE

Patented assembly construction of lock-seamed barrel and one-piece formed heads leaves no crevice in the joint to trap strands of fine wire.

Full curled heads finished in gold lacquer provide a smooth winding edge which will not mar the finest enameled wire.



This Clark spool is made from tin plate specially rolled for maximum rigidity. It is permanently assembled, rugged, yet light and free running for all winding and shipping operations.



2 1/16" Fine Wire Spool With 1½" dia. Barrel

Length Traverse	Cu. In. Capacity
2¾"	8.0
3"	8.7
3¼"	9.4
3⅜"	9.8
3 7/16"	10.0
3½"	10.2
3⅝"	10.5
3¾"	10.9
4"	11.6
5"	14.5

— For —

Winding & Shipping

Fine Wires —

Steel

Copper

Enameled

3" Fine Wire Spool With 1¾" dia. Barrel

Length Traverse	Cu. In. Capacity
2¾"	12.8
3"	14.0
3¼"	15.1
3½"	16.3
With 1½" dia. Barrel	
2¾"	14.6
3"	15.9
3¼"	17.2
3½"	18.5

J. L. CLARK MANUFACTURING CO.

600 23rd Avenue — Rockford, Illinois

The New Royle Heating and Circulating Unit for Heat-Transfer Control

JOHN ROYLE & SONS, INC., of Paterson, N. J., announce the development of the Royle heating and circulating system for heat-transfer media was designed primarily for use with our extruding machines, to enable users to arrive at higher jacket temperatures than heretofore without resorting to high pressure.

✦ ✦ ✦

THIS unit has been developed for use with oil and other heat-transfer media where desired temperature is kept below the boiling point of the material used.

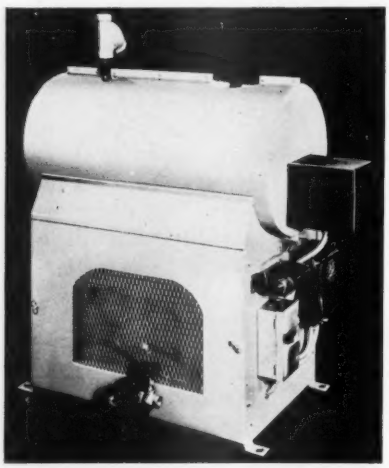
✦ ✦ ✦

WHILE its first field of use has been as an accessory to Royle Extruding Machines in the plastics industry, the unit may be applied also to types of hydraulic presses, molds and other machines where a positive circulation of thermostatically regulated heat-transfer media is indicated.

BASICALLY, the standard unit comprises a tank-type reservoir heated by a thermostatically controlled 6,000 watt electric immersion heater, with a special motor-driven hot oil pump, strainer and automatic pressure relief valve. At slight extra cost, immersion heater elements of higher capacity up to 11,000 watts are available.

✦ ✦ ✦

THE tank is fully insulated with glass wool, covered with a steel jacket and mounted on a sturdy welded steel frame. The enclosed base frame houses motor and pump and is provided with removable side panels for ready access. Interior piping is insulated. Tank has a four-inch tank hole for cleaning purposes.



✦ ✦ ✦

THE entire unit is well proportioned and presents an excellent appearance in addition to its operating efficiency.

✦ ✦ ✦

Specifications

Height ..... 37 inches.
Floor Space ..... 19 x 36 inches
Tank Capacity ..... 10 to 11 Gallons

✦ ✦ ✦

Metals Analyzed by New Machine

AN automatic machine which rapidly and accurately analyses various materials, an invention expected to prove of tremendous value in accelerating the inspection of metals and alloys in the nation's defense program, has been developed by Professor George R. Harrison and his associates at the Massachusetts Institute of Technology.

✦ ✦ ✦

THE device, known as an automatic high speed recording spectrophotometer, not only analyzes materials, as does the spectroscope, but quickly draws the graphs and curves depicting the results of its analysis. It completes the entire process for a given sample in about 100 seconds —less than two minutes.

✦ ✦ ✦

Cost of Raw Materials Rising In Japan

RISING raw material costs, particularly of imported scrap, caused Japanese iron and steel producers to petition for permission to advance quotations in compensation. The military authorities opposed granting this increase as inconsistent with the official low price policy, but the Ministry of Commerce reportedly favored appropriate increases in order to insure that production would continue at satisfactory levels.

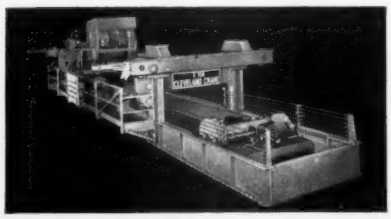
Cleveland Crane & Engineering Furnishes Special Cranes To Navy

THE Cleveland Crane & Engineering Co., Wickliffe, Ohio, have furnished two special cranes of unusual construction to the Navy Department, Bureau of Yards and Docks for Navy Yard, Portsmouth, N. H.

✦ ✦ ✦

THE cranes have a cantilever extension which makes it possible for the trolley to go beyond the crane runway and convey loads into the adjacent bay. The crane bridge is underslung so as to permit the trolley, when traveling into the next bay, to clear under the runway girder.

✦ ✦ ✦



THIS type construction makes it easy to transfer material from one bay to the other without any handling between required.

✦ ✦ ✦

THE construction is all-welded steel throughout with all bearings of the anti-friction type. Spring-type bumpers are provided for trolley and one side of bridge. Gear cases are oil tight. Bridge wheels, gears and pinions are of tool steel.

✦ ✦ ✦

THE cranes are operated from a closed-type cab mounted on the end of bridge opposite from bridge extension.

✦ ✦ ✦

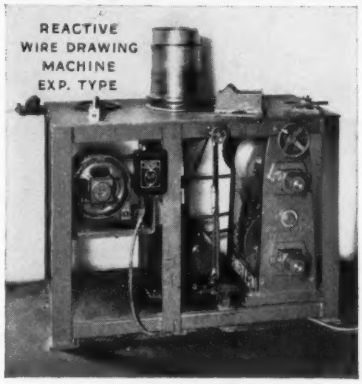
THE capacity of the crane is 5 tons and span approximately 37 feet. Vertical travel of hook is 86 feet. Speeds are hoisting 40 FPM, trolley 100 FPM, and bridge 350 FPM.

SINGLE HOLE AND CONTINUOUS PRODUCTION MACHINES

MORE WIRE and BETTER WIRE---At Less Cost

Less Power Per Ton

Lower Die Costs



More Production

Lower Costs Per Ton

(Manufactured and sold under Smith-Stringfellow Patents)

ADDRESS

REACTIVE WIRE DRAWING

Room #36, Central Exchange Bldg., Worcester, Mass.

SWAGE CONNECTORS OR TERMINALS TO CABLES

and they can't pull loose!

The connection illustrated was cut away to show how it was imbedded in the cable.

Fittings may range from high carbon steels to copper.

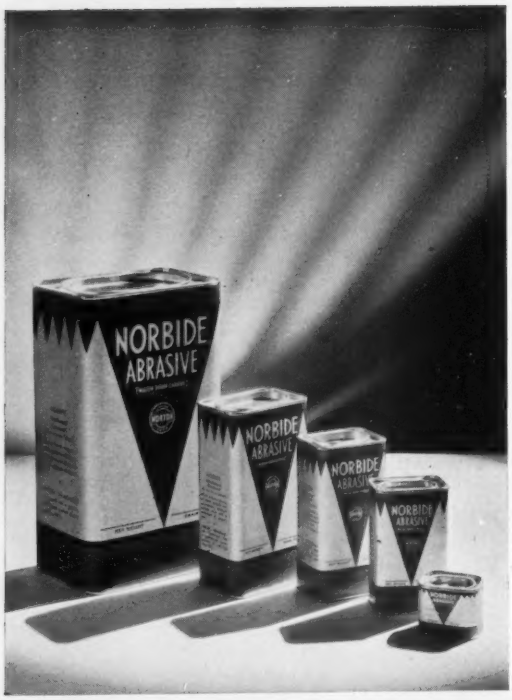
A STANDARD SWAGING MACHINE will do the job — no limit as to size or material.

Write for Catalog Section SM.

IT'S STANDARD PRACTICE

MACHINERY COMPANY

PROVIDENCE, RHODE ISLAND



NORBIDE
ABRASIVE

For
Cemented
Carbide
Dies

Used in place of diamond dust it reduces the cost of shaping, ripping and finishing.

NORTON COMPANY
WORCESTER, MASS.

N—38

NORTON ABRASIVES

Bell-Mine
Pulverized Lime

FOR WIRE DRAWING

WARNER COMPANY Lime Bell Mine Products BELLEFONTE DIVISION

"Bell-Mine" Lime is free from grit and other impurities
.....has a high guaranteed content of Calcium
.. is unusually slow settling in the milk of Lime Box
.. is truly economic in use.

Warner Company
BELLEFONTE DIVISION
SALES OFFICES: PITTSBURGH, PHILADELPHIA, BELLEFONTE, N. Y. CITY.

New Screw Steels Announced

UNION Drawn Steel Division of Republic Steel Corporation, pioneer in the production of efficient machining steels, has just announced a new Bessemer screw steel and a new open hearth screw steel — equal or superior in machining qualities to the finest and fastest screw steels available today — superior in soundness and free from variation in machinability. Developed to overcome deficiencies in fast machining steels formerly available, it is claimed that bar after bar of these new steels can be machined at highest speeds with a resulting fine surface finish and without reduction in tool life.

✦ ✦ ✦

PRODUCED through the combination of modern chemistry and an advanced process of manufacture, these steels are remarkably sound and dense in structure, free from defects which cause internal seams and difficulties that lead to rejection of finished parts and which shorten tool life and disrupt continuity of high speed machining operations.

✦ ✦ ✦

THE new uniform fast cutting Bessemer steel, Union Maxcut, has physical properties comparable to S. A. E. X 1112. It machines equally as well or better than the highest speed Bessemer steel previously available. Parts show a smooth, fine finish when machined at 280 surface feet per minute with a basic feed of .0095" and an average tool life of more than eleven hours. The use of lighter feeds, of course, permits much higher cutting speeds. Union Maxcut responds to cyaniding and other case hardening features in a manner similar to S. A. E. X 1112.

✦ ✦ ✦

UNION Multicut, the new, fast cutting open hearth steel, has physical properties similar to those of S. A. E. 1115. Machining results are equal or superior to those of the highest speed open hearth screw steels previously on the market. Parts show a fine finish comparable to that of Bessemer screw stock when machined at 275 surface feet per minute with a basic

feed of .0087" and an average tool life better than eight hours. With lighter feeds, this steel can be run up to 350 surface feet per minute with satisfactory results. Union Multicut can be carburized and hardened to a minimum case hardness of C 60 Rockwell with either single or double quench. It produces a very tough, ductile core in case hardened parts with a minimum of distortion in quenching.

✦ ✦ ✦

BOTH steels have been tested on the automatic screw machine in Union Drawn's experimental laboratory in Massillon under conditions closely approximating those of actual production operation. They have also been used in actual production runs in the plants of a number of screw machine parts producers.

✦ ✦ ✦

The Royle Forum

A RECENT publication of the house organ of **John Royle & Sons**, Paterson, New Jersey, published under the title of "The Royle Forum" gives a splendid picture of the organization and personnel as well as of the facilities of the plant for the production of special machinery for the wire and cable and the insulated wire industry.

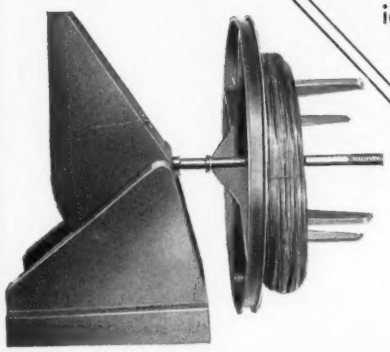
✦ ✦ ✦

AMONG their most recent developments is the **Thermo Plastic** Extruder for covering insulated wire with the various types of resin compounds which have recently been developed for insulating purposes.

✦ ✦ ✦

J. E. Jackson, Metallurgist, Copper, Iron and Steel Development Ass'n

J. EUGENE JACKSON has been appointed metallurgical engineer of the Copper Iron and Steel Development Association, with headquarters in Cleveland. He will act as technical service representative of the association of copper producers, whose aim is to direct the increasing tonnage of copper employed in iron and steel to the best possible advantage.

SHIFTWEIGHT
TILTING WIRE REEL
300 POUND CAPACITY
It is doing the job and warrants your consideration; your inquiries solicited.
Shiftweight enables one man to do a two-man job.
The shifting weight does the lifting.

MOSLO MACHINERY, Inc.
5005 EUCLID AVE.
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RODINE
ACID INHIBITOR
1. Stops Waste of Acid and Metal.
2. Prevents Over-Pickling.
3. Eliminates Acid Fumes.
4. Reduces Acid Brittleness.
5. Cuts Costs.
6. Increases Tonnage.
Ask for Bulletin.
American Chemical Paint Co.
Dept. 306, AMBLER, PENNA.
Detroit, Mich. Walkerville, Ont.

More Tonnage per Pound!
You can get a much higher tonnage of steel wire per pound of lubricant, insure longer die life and maintain better finish, with
MAGNUS WIRE DRAWING COMPOUNDS
Specially formulated to meet the definite conditions of wire size, type of drawing operations and other factors you face in your mill. There's a Magnus lubricant to suit your problems exactly on both wet and dry drawing operations.
GET THIS PERFORMANCE DATA
Ask for your set of reports covering performance of Magnus Wire Drawing Lubricants on all kinds and types of wire.
MAGNUS CHEMICAL CO.
188 South Ave., Garwood, N. J.
MAGNUS CLEANERS

Learn about PARALAN

Paralan will give your finished wire and wire products protection from atmospheric corrosion in the mill and in shipping. Paralan-coated wire can be spot welded or soldered without cleaning. Also, Paralan leaves surfaces in good condition for all types of finishes—enameling, japanning, lacquering, plating, etc.

Write for further information. We may be able to solve your difficulties.

AMERICAN LANOLIN CORP.
LAWRENCE, MASSACHUSETTS

STEELSKIN

REG. U. S. PAT. OFFICE

For High or Low Carbon Wire

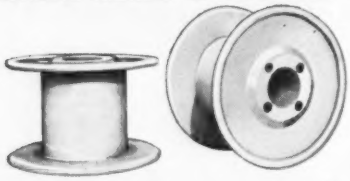
WIRE DRAWING SOAPS

Established 30 years

R. H. MILLER CO., Inc. Homer, N. Y.

APCO MOSSBERG

STEEL REELS & SPOOLS



For The Copper, Steel, & Wire Rope Industry

Apco Mossberg Steel Reels are standard equipment in the wire industry—and for good reason! Apco Mossberg—the original Frank Mossberg Co.—**originated** the steel reel idea and have been training workmen in their manufacture ever since. Personal attention by Apco Mossberg engineers make each job a "special".

FREE ENGINEERING SERVICE

We will gladly submit drawings, blueprints, or suggestions without obligation to you. Write for quotation today.

APCO MOSSBERG CO.
(The Original Frank Mossberg Co.)
21 Lamb Street, Attleboro, Mass.

Portable Butt Welder with Burr Grinder

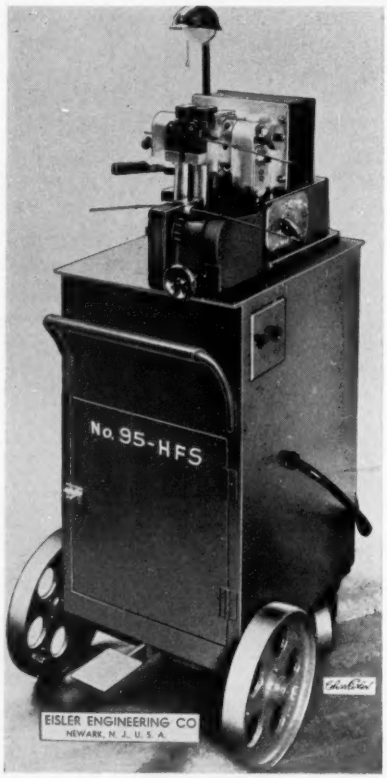
THE **Eisler Engineering Co.** of 740-770 So. 13th St., Newark, N. J., has developed a new portable Butt Welder with a Burr Grinder and annealer mounted on a fabricated case which is portable. One of its many applications is in the repair of stranded wire where this unit is used to burn out (electrically) the faulty section and fuse all the strands, thereby preventing the ends from unraveling. The final steps are to butt weld the two ends, and grind off any burrs that may have appeared. The grinder has an accurate adjustment to compensate for the wear in the abrasive and there are two special bushings to guide the stranded wire to the grinder which squares off the ends so as to make neater butt welds.

✦ ✦ ✦

ALL wiring has been concealed within the fabricated case, and a draft tube has been provided to remove the grinding dust from the vicinity of the work.

THE Butt Welder is supplied with a 3 KVA air-cooled transformer and 8 point variable switch for current regulation. The unit is foot operated and the butt jaws can be water-cooled for continuous service.

✦ ✦ ✦



METALS from 1/16" to 3/16" diameter can be welded. For butt welding other sizes of wire or metals, the units are available with transformers from 1 KVA up to 7½ KVA capacity. Production is increased because the grinder and annealer are in the one compact unit with the Butt Welder.

✦ ✦ ✦

Cotter Pins for Argentina

ALTHOUGH cotter pins are manufactured in Argentina by far the greater part of the local demand continues to be met by imports, largely from Germany and France except for automotive cotter pins which come principally from the United States. Although supplies of pins from European sources have been cut off in large part, stocks on hand are reported far from exhausted.

Anaconda Wire & Cable Producing New Type of Lead Covered Cable

H. DONN KERESEY, president of the Anaconda Wire & Cable Co., announced that his company has completed their development of type CB (carbon black) cable, a high voltage paper impregnated lead sheathed construction and is now manufacturing it on a regular production scale. Reports from the company engineers, according to Mr. Keresey, indicate that in service cyclic loading and ageing tests simulating actual operating conditions, this new cable lasted almost twice as long as standard shielded cable and during the test period which lasted 435 days, showed extraordinary over-all stability.

✦ ✦ ✦

THIS improvement in paper impregnated cable has long been anticipated since the beneficial effect of carbon black on insulating oils is common knowledge. It was a matter of finding a method of application. Now that it has been found it is expected that the application of carbon black will be extended beyond solid type construction of oil-filled and gas pressure cable as well.

✦ ✦ ✦

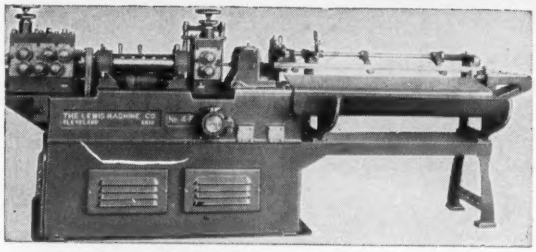
Republic Issues New Chart of Stainless Steel Properties

REPUBLIC Steel Corporation, Cleveland, O., has just released a handy four-page, letterhead size folder which contains a table listing the analyses and properties of 13 of the most popular types of Enduro stainless steel. For comparison purposes, identical data for a carbon steel, S.A.E. 1020, are listed.

✦ ✦ ✦

THE chart includes the American Iron & Steel Institute type numbers, approximate chemical compositions, physical properties, electrical properties and mechanical properties. In addition, heat-treatment is indicated, heat-resistance is shown and fabricating properties, including welding, machining and drawing or stamping, are described.

LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to ¾" rod
Round
Square
Flat
Hexagon
Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

The Sign of Dependable Service:
WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE

THE LEWIS MACHINE CO., 3445 E. 76 St., Cleveland, Ohio

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These machines are made in eleven different sizes. This enables us to cover any size of nail most efficiently.

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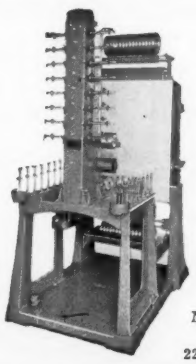

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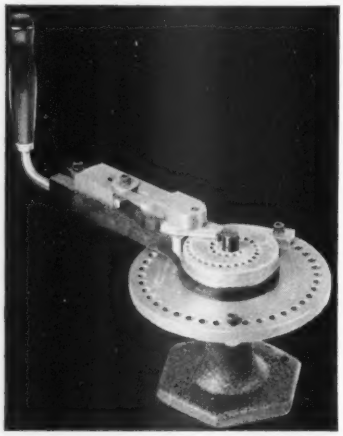
WE show below cut of a new hand bending machine which will eliminate the nuisance and expense of making and forming dies in a case where only a small number of parts are to be formed. Usually it is not possible to accurately duplicate a small number of parts without a forming die and often a small number of parts to be formed makes the die cost prohibitive.

✦ ✦ ✦



THE value and necessity of a tool of this kind will be realized when one of a number of tubes, rods, odd or elongated shapes are required to be formed by hand on specially made jigs. This tool will do the work in a quick and efficient manner, saving time, labor and money. Material can be cut to exact lengths before forming, effecting a saving in material and avoiding the usual waste and loss involved in trimming the product after forming.

✦ ✦ ✦

IT is further claimed that this Multi-Purpose Bender:

1. **Accurately bends rod, square or flat rod, tube, rod and strip stock.**
2. **Forms hooks, eyes, loops, springs, angles, brackets and various odd shapes.**
3. **Forms any radius from 0" to 6" in diameter.**
4. **Parts to be formed may be cut to exact lengths before forming thus effecting a saving in material and eliminating loss.**

✦ ✦ ✦

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Hartley Wire Die Moves to New Quarters

HARTLEY Wire Die Company formerly of Waterbury, Conn. have announced their removal to larger quarters at Thomaston, Connecticut, increasing by approximately 15,000 square feet their floor space formerly available.

✦ ✦ ✦

THE company, producers of Carboloy dies for drawing, sizing and extruding purposes, recently celebrated its 90th anniversary, and is said to have been the first organization in this country to make diamond dies.

✦ ✦ ✦

Callite Tungsten Purchases Harris Alloys, Inc.

CALLITE TUNGSTEN CORP., Union City, N. J., has purchased Harris Alloys, Inc., Newark, N. J., as the first step to expand wiremaking facilities, according to Charles H. Kraft, president. The company will manufacture brush and Fourdrinier wire and wire of stainless steel, monel, phosphor-bronze, beryllium-copper and special alloys.

✦ ✦ ✦

THE company states its business in the first half of 1940 greatly exceeded that of the first half last year and current backlog of orders is well above that of a year ago.

✦ ✦ ✦

New Periodical on Metal Spraying

METALLIZING Engineering Co., Inc., manufacturers of Metco Metallizing Equipment, announces the first issue of METCO NEWS—a periodical devoted entirely to the latest developments and applications of the metal spraying process. All those actively engaged in the maintenance, salvaging or manufacture of metal products or equipment may receive this and ensuing issues, without cost, by writing to the publishers at 21-07 41st Avenue, Long Island City, New York.

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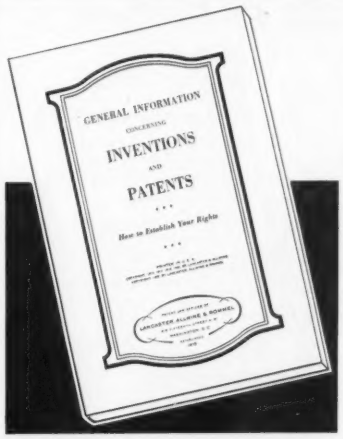

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National Metal Congress

THE 21st National Metal Congress, to be held in Cleveland October 21 to 25, is showing every indication of marking an epoch in the technical sessions of the American Society for Metals.

✦ ✦ ✦

THE cooperating societies also have their programs well advanced, the American Welding Society having 55 papers to present at their sessions, while the Institute of Metals and the Iron and Steel Divisions of the American Institute of Mining and Metallurgical Engineers and the Wire Association have planned extensive programs.

✦ ✦ ✦

THE American Society for Metals will have approximately 14 sessions besides the educational lectures in the late afternoon and early evening.

✦ ✦ ✦

THE National Metal Exposition is "going to town". It is at present the largest show that has ever been held in the long history of the Society. Over 235 exhibitors have reserved 90,000 square feet of exhibit space, and three extensions of the "space available" have been rendered necessary by the enormous demand for representation in this exposition.

✦ ✦ ✦

IT has been determined that the theme of this exposition will be "New Aids to Production". This is particularly appropriate at this time in the light of the tremendous activity in national defense and industrial expansion.

✦ ✦ ✦

THE exposition is to be held in the Cleveland Public Auditorium concurrently with the National Metal Congress the week of October 21.

✦ ✦ ✦

HOTEL Statler will be the headquarters for the American Society for Metals, Hotel Cleveland for the American Welding Society and the American Institute of Mining and Metallurgical Engineers, and Hotel Carter will be the headquarters for the Wire Association.

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Syncro Machine Co., Rahway, N. J.

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Scudder, E. J. Fdry. & Machine Co., Trenton, N. J.

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National Oil Products Co., Harrison, N. J.

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BAKERS—Rod and Wire
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Morgan Construction Co., Worcester, Mass.
Moslo Machinery, Inc., Cleveland, O.
Ross Engineering Corp., J. O., New York, N. Y.

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Callite Electric Corp., Union City, N. J.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

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Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

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CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
American Chemical Paint Co., Ambler, Pa.
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
Magnus Chemical Co., Garwood, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIPMENT—
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Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Hauser-Stander Tank Co., Cincinnati, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

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Scott, Henry L., Co., Providence, R. I.

CLOTH—Wire, All Metals
Callite Electric Corp., Union City, N. J.

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American Lanolin Corp., Lawrence, Mass.
National Oil Products Co., Harrison, N. J.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

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National Oil Products Co., Harrison, N. J.
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COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

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American Monorail Co., Cleveland, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIAMONDS—Industrial
Callite Electric Corp., Union City, N. J.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

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Cochaud Wire Die Co., New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Krause & Co., Inc., F., Jersey City, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
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Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Co., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Krause & Co., Inc., F., Jersey City, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Rod and Tube Drawing
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Tantalum Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Balloffet Dies & Nozzle Co., Inc., Guttenberg, N. J.
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Willey's Carbide Tool Co., Detroit, Mich.

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Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

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Entwistle, James L., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

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Carl-Mayer Corp., The, Cleveland, O.
Drever Co., The, Philadelphia, Pa.
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.

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Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.

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Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
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Electric Furnace Co., Salem, O.
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Electric Furnace Co., Salem, O.
Robertson, John, Co., Brooklyn, N. Y.
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FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
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FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, O.
Surface Combustion Corp., Toledo, Ohio.

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Lee Wilson Engineering Co., Cleveland, Ohio

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National Oil Products Co., Harrison, N. J.

INSTRUMENTS—Electrical
Entwistle, James L., Pawtucket, R. I.

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National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Magnus Chemical Co., Garwood, N. J.
Miller Co., R. H., Homer, N. Y.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

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New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Chain Making
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Entwistle, James L., Pawtucket, R. I.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY—Draw Benches
Standard Machinery Co., Providence, R. I.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
Robertson, John, Co., Brooklyn, N. Y.
Royle, John & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Galvanizing
Lee Wilson Engineering Co., Cleveland, Ohio

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Insulating
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Magnet Wire
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Material Handling
American Monorail Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works Co., Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
National Rubber Machinery Co., Akron, O.
Royle, John & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Stranding
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Entwistle, James L., Pawtucket, R. I.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Testing—Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

MACHINERY—Welding Wire
Eisler Engineering Co., Inc., Newark, N. J.
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt, Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Reactive Wire Drawing, Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
National Rubber Machinery Co., Akron, O.
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
New England Butt, Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MATERIAL HANDLING EQUIPMENT—
American Monorail Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.
Torrington Mfg. Co., The, Torrington, Conn.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Industrial
Carl-Mayer Corp., Cleveland, Ohio.
Ross Engineering Corp., J. O., New York, N. Y.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING COMPOUNDS
American Chemical Paint Co., Ambler, Pa.
National Oil Products Co., Harrison, N. J.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Robertson, John, Co., Brooklyn, N. Y.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

REACTIVE WIRE DRAWING
Reactive Wire Drawing, Worcester, Mass.

RECORDERS—Fault and Reel
Entwistle, James L., Pawtucket, R. I.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery, Inc., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster Co., F. B., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Hayward Co., R. B., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS—Takeoff
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B. Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hayward Co., R. B., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B. Co., New Haven, Conn.
Stevens Metal Products, Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Hayward Co., R. B., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products, Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS
Carl-Mayer Corp., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
Ross Engineering Corp., J. O., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

ROLL STRAIGHTENERS—
Moslo Machinery, Inc., Cleveland, O.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Continental Steel Corp., Kokomo, Ind.

SKIN PROTECTOR—
Magnus Chemical Co., Garwood, N. J.

SOAPS—Industrial and Wire Drawing
Magnus Chemical Co., Garwood, N. J.
Miller, Co., R. H., Homer, N. Y.
National Oil Products Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago, Ill.

SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

SPOOLS—Annealing and Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Chicago, Ill.

SPOOLS—Shipping and Shop
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Hayward Co., R. B., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
Apco Mossberg Co., Attleboro, Mass.
Clark Mfg. Co., J. L., Rockford, Ill.
Hayward Co., R. B., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Corp., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TAKE-UPS FOR CABLE, HOSE, LEAD PRESSES AND SHEET RUBBER—
Entwistle, James L., Pawtucket, R. I.

TANKS—Acid
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Lead Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Pickling
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Rubber Lined
Hauser-Stander Tank Co., Cincinnati, O.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TANKS—Wooden
Hauser-Stander Tank Co., Cincinnati, O.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Entwistle, James L., Pawtucket, R. I.
Scott Co., Henry L., Providence, R. I.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Micro Products Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Nickel Silver and Phosphor Bronze
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Stainless Steel
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

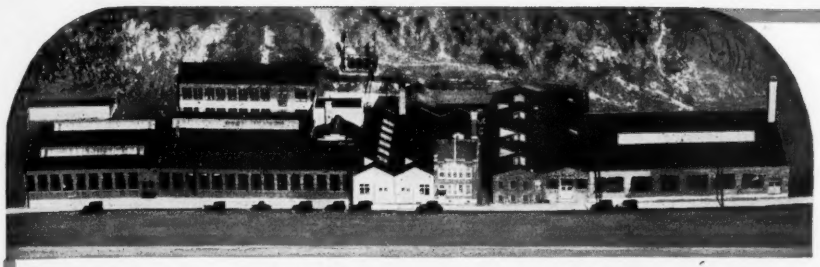
WIRE—Steel—Also Coppered Steel——Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non Ferrous
Hudson Wire Co., Ossining, N. Y.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.



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TWO MODERN AND COMPLETE WIRE PLANTS—— AT YOUR SERVICE——

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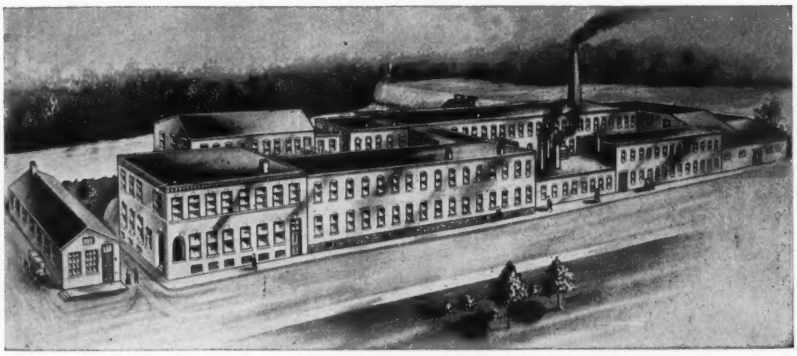


Winsted Divn. of HUDSON WIRE CO. at Winsted, Conn.

HUDCO

FINE BARE WIRES

High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

Cadmium, Nickel Silver, 10%, 18% and 30%; Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

WIRES FOR METAL SPRAYING

Pure Lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity, Electric Wire.

Cadmium, Nickel Silver, (10%, 18%, 30%); Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from Selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing. BETTER WIRE AT LOWER COST.

LET US QUOTE

HUDSON WIRE COMPANY

OSSINING, N. Y.

SUCCESSORS ROYLE & AKIN

ESTAB. 1902 ESTAB. 1902

WINCO

LEAKPROOF ENAMELLED WIRES

Drawn from special oxygen-free copper that works so clean, so free from slivers, that enamelling is perfect. Leaks positively prevented. Every foot of WINCO enamelled wire is mercury tested before shipment to assure a wire perfect in every particular.

WINCO enamelled wire is covered to the same dimensions as fabric-covered wire so the user need not change his equipment. It will withstand softening in varnish-dipping and baking.

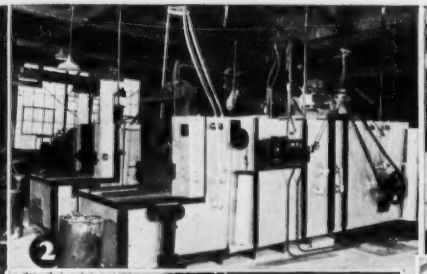
WINCO enamelled wire is lower in cost than silk covered wire. Write for sample.

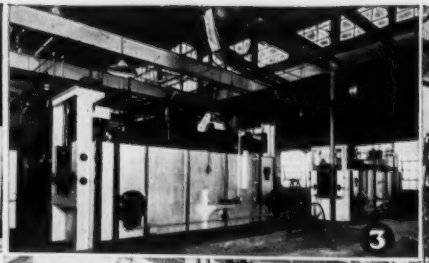
LET US QUOTE

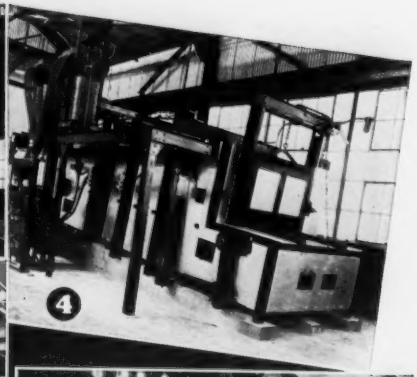
WINSTED DIVISION

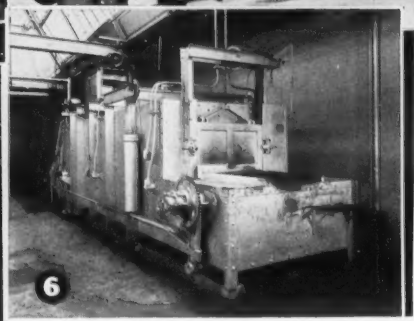
HUDSON WIRE COMPANY

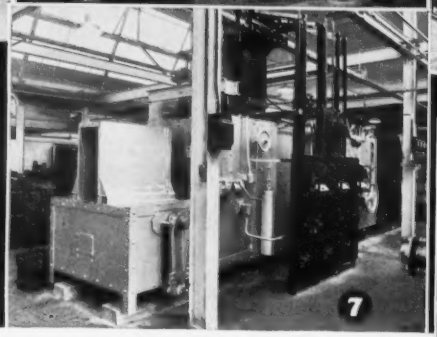
WINSTED, CONN.

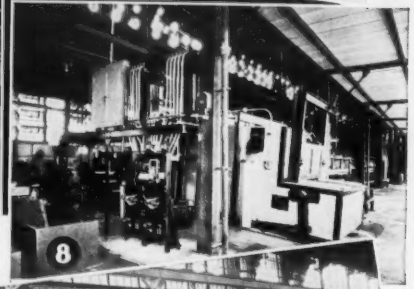


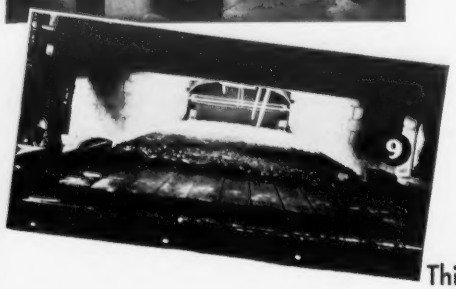












Some EF Continuous Chain Belt Conveyor Furnaces for

Bolts, Springs, Bearing Parts and Other Small and Medium Size Products

This type also built for scale-free hardening - - - without decarburizing

The 10 views above show 16 EF continuous chain belt conveyor furnaces—all handling bearing parts—a few of the numerous installations of this type furnace we have made for the uniform, economical heat-treatment of miscellaneous small and medium size parts and products. Over 100 of these furnaces now in operation - - - with capacities ranging from 300 to 1700 lbs. per hour.

Other EF Chain Belt installations are handling bolts, nuts, rivets, springs, sprockets, forgings and many other products ranging in size from small screws to large crawler links for tractors. These furnaces may be electrically heated or gas fired and designed for using protective atmospheres for scale-free heat treating and hardening without decarburization.